

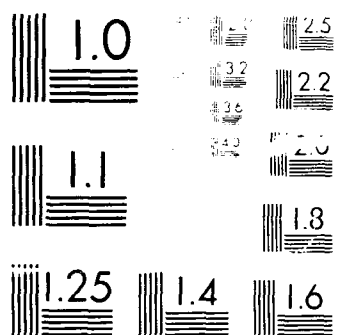
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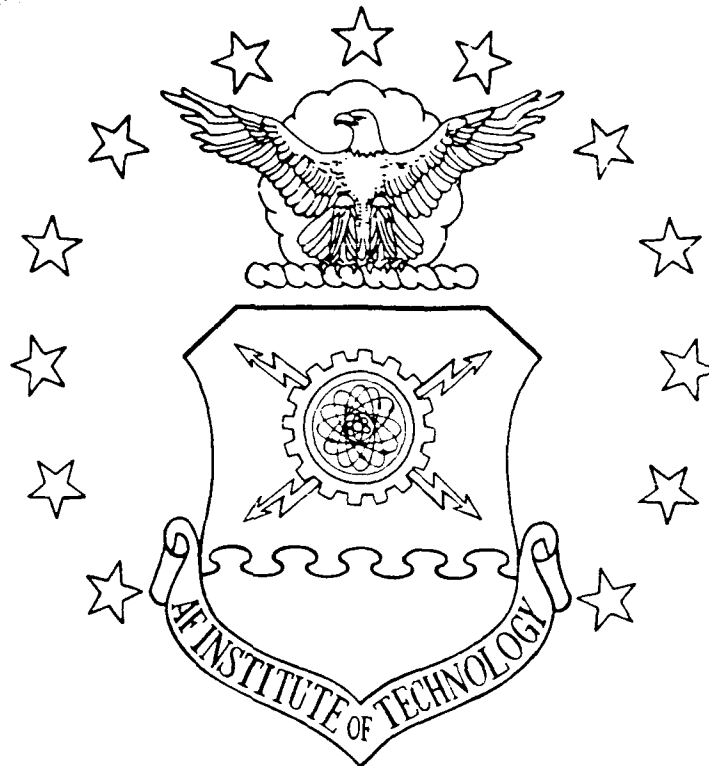
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THE IDENTIFICATION AND EVALUATION
OF FLIGHT TEST CATEGORIES OF
RESPONSIVENESS IN REPORTING WEAPON
SYSTEM TEST PROGRAM INFORMATION BY
THE 4950TH TEST WING

THESIS

Thomas E. Lollis II
Captain, USAF

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4950TH TEST WING

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Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Systems Management

Thomas E. Lollis II, B.S.™ E.

Captain, USAF

September 1989

Approved for public release; distribution unlimited

Acknowledgements

I want to express appreciation to God who allowed me the opportunity to gain knowledge from this research--for respect of God is the beginning of knowledge. My heartfelt thanks go to my wife, Lee Ann, and our son, Thomas Edward III, who gave so very much sacrifice and support. Deep appreciation also goes to my parents, relatives, and friends for all of their contributions and encouragement.

To Dr. Charles R. Fenno, perhaps the best educator and most insightful advisor one could have the privilege of working with, I am truly grateful. Thanks also go to Lt Col John Dumond, whose expertise in weapon system test management enhanced this study.

I want to thank my sponsors at the 4950th Test Wing: Mr. Jim Harrass, Mr. Jim Lewis, and Maj David Ross, who were always anxious to help and a pleasure to work with.

Finally, appreciation is due to the following managers from the Test Wing and the System Program Offices and Labs who participated in the interviews: Capt Enrique G. Hernandez, Mr. Charles Castro, Mr. Jerry Bullmaster, Mr. David Knott, Mr. Steven Trent, Maj Kevin Campbell, Capt James C. Higgins, Ms. Lydia Houser, Mr. Raymond Acus, Maj Robert B. Spangler, Mr. Robert Marx, Mr. Allen Johnson, Mr. Thomas L. Madden, Capt Kevin Freese, and Mr. Dean King.

Thomas E. Lollis II

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Abstract

The purpose of this research was to identify meaningful measures (categories) of responsiveness for 4950th Test Wing managers and System Program Office/Laboratory managers to use to evaluate Test Wing effectiveness and responsiveness in meeting customer test program information needs.

The study found that Test Wing managers have available to them a prescribed list of categories of information (from Appendix H, Test Director's Guide, 4950 TESTWP 80-1) through which they can report test program information to their customers. Customers such as the Aeronautical Systems Division System Program Offices and the Wright Research and Development Center Laboratories differ from Test Wing managers in their perceptions about which categories are applicable to their programs. Test Wing managers and their customers value the importance of the categories of information similarly for most of the categories. Although many perceptions about the category of information applicability and importance may be similar, differences do exist and for a variety of reasons.

The Test Wing was rated by itself and its customers in how flexible they were perceived to be in negotiating what and how information for each category was to be reported to customers. Results showed that Test Wing managers and their customers have similar perceptions. The highest ratings

were received for the categories of flight testing, schedule, planning, technical performance, and instrumentation. The lowest mean ratings occurred for the categories of cost, manpower, funding, and documentation.

In rating Test Wing overall reporting performance for each category of information, Test Wing managers and their customers have similar perceptions. The Test Wing received highest ratings for their reporting in the categories of range support, flight testing, safety, schedule, and planning, and lowest ratings for prefab, modification installation, and manpower.

Open-ended comments by the interview respondents suggested reform in the methods in which the Test Wing reports cost information.

THE IDENTIFICATION AND EVALUATION OF FLIGHT TEST CATEGORIES
OF RESPONSIVENESS IN REPORTING WEAPON SYSTEM TEST
PROGRAM INFORMATION BY THE
4950TH TEST WING

I. Introduction to the Study

General Issue

The flight testing of newly developed or modified weapon systems is an important responsibility of the Air Force. The challenge arises not just because of the complexity of today's weapons systems but also because of the complexity of managing and reporting test program progress. The effective management of a test program requires accurate and timely test program progress information as input for decisions that affect the test program. The reporting of test program progress information is done by an Air Force agency called a responsible test organization (RTO). The RTO is responsible for conducting the flight tests and reporting test data and test program progress information to its customers--often system program offices (SPO). One important ingredient of an effective test program is the program's responsiveness in reporting test information to its customers. Colonel Michael Baran, former test director for the B-1B bomber program and former customer of an RTO, said the following about the need for effective reporting of test program progress information:

To manage, you must have timely, effective feedback which permits you to assess progress and diagnose problems. . . . The Director of Test must establish the responsibilities and data flow between the SPO and the RTO. This is not an easy task, and history would indicate it is one that has seldom been done well.
(4:69)

One of Air Force Systems Command's (AFSC) RTOs, the 4950th Test Wing, has expressed a need for development of meaningful measures (or catagories) of responsiveness for its managers to use to determine the Test Wing's responsiveness in meeting customer needs.

Objectives of this Research

This research project has two specific objectives:

1. to determine the similarities and differences that may exist between the perceptions of the 4950th Test Wing and its customers concerning what constitutes effective reporting, and
2. to determine the similarities and differences that may exist between the Test Wing's assessment of its performance and its customers' assessment of Test Wing performance in reporting information.

The research involves the identification of meaningful measures (or catagories) of responsiveness for 4950th Test Wing managers and SPO managers to use to evaluate Test Wing effectiveness and responsiveness in meeting customer test program progress information needs.

Research Questions

The following investigative questions must be answered in order to meet the two research objectives:

1. What are the current categories of information that the 4950th Test Wing reports--from the SPO management perspective and from the Test Wing management perspective?

2. What, if any, additional categories of information do the Test Wing or its customers believe should be reported?

3. What, if any, categories that are currently reported do either the Test Wing or its customers feel should not be reported?

4. What are the relative weights assigned to the actual and desired categories by SPO management and Test Wing management?

5. What are the most common methods Test Wing managers use in reporting test information for each category to SPO managers, as perceived by the Test Wing and by its customers?

6. What, if any, differences in reporting practices would SPO managers recommend?

7. What, if any, differences would Test Wing managers prefer to make in reporting information to their customers?

Research Scope

This research effort will consider only local area 4950th Test Wing customers from Aeronautical Systems Division (ASD) and Wright Research and Development Center (WRDC). Both of these Test Wing customers are tenant organizations based at Wright-Patterson Air Force Base (WPAFB). Until recently, WRDC was known as Air Force Wright Aeronautical Laboratories (AFWAL). Limitations of time and travel funds prohibit an examination of Test Wing customers from other AFSC product divisions. Although the research issues of interest are relevant to other test wings and

product divisions, the conclusions of this research effort will be specific to the 4950th Test Wing, ASD, and WRDC.

II. Literature Review

Chapter Overview

This chapter presents a review of literature on the guidelines and policies governing the reporting of test program progress. Background about information gained by testing weapon systems is discussed, followed by a brief explanation of the Test and Evaluation (T&E) process that theoretically occurs between System Program Offices (SPOs) and Responsible Test Organizations (RTOs). Regulations and pamphlets specifically addressing the information reporting policies of the 4950th Test Wing are also discussed.

Background

The basic purpose of testing is to gain information. Information gained from testing is important to systems acquisition program managers. These program managers need test information in order to make competent management decisions related to the timely development, production, and fielding of systems that meet the user's requirements and are operationally effective and suitable (8:2). The different types of information yielded by testing are useful to different people in different ways. For example, weapon system design engineers are interested in the quantitative flight test data representing the weapon system performance. SPO test managers are interested in performance data as well, but in their function as the managers responsible for

entire test programs, they are also concerned with information regarding the test program progress.

Test program progress is achieved by the test pilots, engineers, and technicians in the RTO. Depending on the program, a private contractor may also be involved in performing flight tests. The progress that is made is reported by a test wing manager at the RTO to the SPO test manager. As alluded to earlier, the effectiveness of a test program is dependent on the program's responsiveness in reporting test information to its customers.

The way in which test program progress is reported by the RTO depends somewhat on the agreement that is negotiated between the SPO and the RTO. When a test program is initiated, a relationship is formally established between a SPO and an RTO via a process that is discussed in the next section. The SPO is ultimately responsible for the overall test program and has overall management and control responsibility. In a sense, the RTO serves the SPO in the capacity of a contractor by performing and managing the day-to-day flight test activities. Since the SPO test manager is responsible for the success of the test program, he or she must implement a control system to monitor and (whenever necessary and possible) influence the activities of the RTO. Adams and Martin describe the need for such a control system in the following way:

Control systems are necessary to bring this information to the attention of the project [or SPO

test] manager early enough to avoid a crisis by means of a budget or some other project change. (1:51)

If timely and appropriate information about the test program progress can be reported by the RTO to the SPO within the control system, the SPO manager can compare the reported information with planned performance and consider whether change to the baseline plan is necessary (1:52).

Project management literature identifies three critical categories of information that must be reported to managers: cost, schedule, and performance (1:53). These same three categories of information are identified in the Aeronautical Systems Division (ASD) pamphlet, ASDP 80-14, as system technical performance, test schedule, and test support cost (6:39).

Although reporting information in the categories of cost, schedule, and performance fulfills a requirement in satisfying the basic control system needs of the SPO test manager, these categories do not encompass all of the information that program managers need for effective management. As stated in the objectives section, this research effort will, among other things, determine what constitutes effective reporting in terms of categories of responsiveness. This research effort, in its attempt to identify and evaluate the categories of responsiveness, will also provide an assessment of how satisfied some of the Test Wing's customers are in terms of the categories used.

Test and Evaluation Process

As discussed in the background section, the basic purpose of test and evaluation in any process is to gain information that will assist a decision-maker in making competent decisions. In the Department of Defense acquisition process, test and evaluation exists in two main forms--developmental test and evaluation (commonly called DT&E) and operational test and evaluation (commonly called OT&E)--to provide information to the review board responsible for making program milestone decisions. This research effort is concerned only with developmental test programs. DT&E is conducted to do the following:

- Assist the engineering design and development process
- Verify attainment of performance specifications and objectives
- Demonstrate that design risks have been minimized
- Estimate the system's military utility when introduced
- Evaluate compatibility and interoperability with existing or planned equipment/systems
- Provide assurance that the equipment/system is ready for testing in the operational environment (5:13-3 to 13-4)

As developmental testing of a weapon system progresses, information is obtained and reported by the testing organization (RTO) to its customer (SPO) as input to the process of managing the program. The Defense Systems Management College (DSMC), a school for current and potential Department of Defense (DoD) acquisition managers, identifies the need for program managers to have proper information in the following:

The Program Manager . . . must maintain a real-time network that provides all the proper information with which to make engineering and program decisions.
(5:13-14)

At a macro level, test program reporting is received at the Secretary of Defense or Secretary of the Air Force level, where the reporting of test results of major programs is necessary for the Defense Acquisition Board (DAB) or the Air Force Systems Acquisition Review Council (AFSARC) to make major milestone decisions. These decisions consist of the following three choices, as defined in the readings of the Air Force Institute of Technology's Test and Evaluation Management course: "(1) approve entry into the next [acquisition] phase, (2) request further Air Force studies, or (3) terminate the program" (13:44).

At the micro level, a SPO test manager will take test program information provided by the RTO and make decisions for the daily management of the test program. The SPO test manager is a functional manager who supports the program manager/director of the SPO. As a supporting manager, the SPO test manager provides input from the test program that influences decisions regarding management of the overall program.

As a point of clarification, this research effort focuses on the micro level of test reporting instead of the macro level. Within the micro level of test reporting, this research focuses on an RTO's reporting of test information

rather than an RTO's performance as a weapon system tester. The RTO under study was the 4950th Test Wing.

The way in which the reporting process is established between the SPO and RTO influences how information is reported. At the inception of a program, guidance from Headquarters USAF is provided to SPOs via a Program Management Directive (PMD) regarding the critical test and evaluation issues and the agencies involved (6:23). Sometimes the RTO is specifically designated in the directive. Once the RTO for the test program is identified, initial planning commences. Planning is done via the Test Planning Working Group (TPWG) as directed by AFR 80-14. Members of this planning group include the SPO test manager as chairman, and representatives from the RTO (i.e., the test agency), the OT&E command, operating commands, supporting commands, participating commands, and contractors (7:5).

Several documents regarding the test and evaluation of the program are generated by the SPO to facilitate the planning and implementation of test management. One such document is the Test and Evaluation Master Plan (TEMP). As described in AFR 80-14, the Test and Evaluation Master Plan will do the following:

. . . integrate critical issues, test objectives, evaluation criteria, system characteristics, responsibilities, resources, and schedules for [Test and Evaluation]. (7:5)

Another document, the Program Introduction document, more directly affects the way in which the RTO will report to the SPO. The Aeronautical Systems Division (ASD) guide for test and evaluation management states that "The [Program Introduction document] is the primary document used to request AF test center/organization support of [Test and Evaluation]" (6:98). The guide also states that the Production Introduction document should ". . . include requirements for fiscal and management information data, [and] technical reports . . ." (6:98).

This Program Introduction document is the basic document in which a SPO test manager formally communicates his or her perceived test information needs to the RTO. Negotiations between the SPO and RTO over the information requirements occur during the preparation of this important document. Sometimes the RTO is inflexible (for various reasons) in its negotiations over the perceived information needs of the SPO test manager. An important part of this research is to identify similarities and differences of SPO managers and RTO managers in their perceptions of what information is negotiated and their perceptions of how flexible RTO managers are in information negotiations.

Once program requirements and constraints are communicated to the RTO by the SPO via the Program Introduction document, the RTO will communicate its understanding of those requirements and constraints back to

the SPO. This response by the RTO takes the official form of a Statement of Capability. The Statement of Capability defines the level of support to be provided by the RTO and specifies the funding reimbursement estimate required of the SPO (6:99). The Program Introduction document and the Statement of Capability will together identify the agreement between the SPO and the RTO on the reporting requirements (among other test and evaluation requirements) that are necessary to manage the test program.

If reporting requirements are not clearly specified in the Program Introduction document-Statement of Capability agreement, the possibility exists that the information may not be reported, or if reported, the information may not be in the form, frequency, or manner desired by the SPO. SPOs will continually negotiate with RTOs over the reporting requirements of the test program (i.e., the formal written negotiations are not the only negotiations that occur). In addition, RTOs have guidelines and policies that govern what and how they report test progress information to their customers, and they usually negotiate from that basis.

Test Reporting Policy

A literature review of the policies and regulations that govern the 4950th Test Wing reporting of test program progress to their customers revealed what type of information is generally reported. The 4950th Test Wing

regulation, 4950 TESTWR 80-4, states the following about reporting progress to the customer:

Progress report[ing] will normally include a short narrative which will: (1) provide an analysis of cost/schedule growth or problems, (2) provide other general information to the customer about the status of the test item, aircraft, test range, etcetera and, (3) provide the customer with the "flavor" of the test progress. (9:21)

The inherent flexibility of this policy gives the Test Wing latitude as to how it can report to the SPO, given manpower and funding constraints.

Another governing document, ASDP 80-14, describes what other test wing responsibilities test reporting also involves:

. . . to ensure maximum use of the information generated as a result of the test, the reports must be timely, factual, concise, and complete. The reports should be balanced and accurately present an overall portrayal of the system under test. (6:44)

The determination of whether or not reporting is timely, factual, concise, complete, balanced, and accurate can be judged by the satisfaction of the customer receiving the reported information. This research will (among other things) identify customer's perception of how well the Test Wing test managers have done overall in reporting information.

III. Methodology

Introduction

The focus of this research methodology was to provide the logical mechanism in which to meet the research objectives. A study of the 4950th Test Wing was conducted to assess perceptions of and performance in reporting flight test information to ASD SPOs and WRDC Labs. The means of collecting data on the Test Wing's reporting performance as perceived by its customers was done by interviewing individual SPO/Lab test managers. In some cases, SPO/Lab program managers were interviewed because they were considered the counterpart manager to whom the Test Wing manager reported information. Hereafter, any reference to SPO/Lab test managers will include the SPO/Lab program managers because of their involvement in testing. Test Wing test managers were also interviewed in the same manner as the SPO/Lab managers to determine their perceptions about their own performance in reporting information to their customers.

Population

The population of test managers targeted for interview was derived from the total population of all 4950th Test Wing customers. Test Wing clientele include such customers as local ASD and WRDC program offices, Electronic Systems Division (ESD) program offices, operational command (Hq MAC)

offices, U.S. Army and Navy organizations, and other test wings. Due to constraints on time and funding, interviews could not be conducted with all Test Wing customers. Also, the differences in customer missions and locations would significantly impact the way in which the Test Wing reports information to its customers. Consequently, this research was limited to local ASD and WRDC program offices.

Lists of ASD and WRDC flight test programs were obtained from the 4950th Test Wing Directorate of Resource Management. The lists included all programs in either the testing, final reporting, or recently completed phase. Programs in the planning phase were omitted because there would have been little or no reporting of information to the customer. Programs that were completed earlier than four months prior to the date of the research were not considered due to the changeover of personnel and loss of recollection of program details.

ASD and WRDC programs are included together in the population of interest, even though they differ from each other in the nature of their business. ASD flight test programs are oriented toward development testing--specifically, testing for the following reasons:

. . . [to] demonstrate for the Air Force that the system engineering design and development is complete, that design risks have been minimized, and that the system will perform as required in its intended environment. (6:2)

On the other hand, WRDC flight test programs are oriented more toward research testing (i.e., proving the feasibility of technologies).

The population of test managers is defined as those test managers who are directly responsible for the daily management of the test program, either from the Program Office side or the Test Wing side. The arrangement is that a specific program has two responsible test managers (the ASD/WRDC test manager and the Test Wing test manager) that interface with each other on the day-to-day flight test activities. The Test Wing test manager reports test program progress information to the ASD/WRDC test manager. Ideally, these counterpart managers would be test managers who have worked on the program since its inception and served as the full time focal point throughout testing and reporting. Because of a high rate of turnover for management personnel, the ideal situation cannot always be achieved; however, interviews were conducted with those managers that most closely fit the ideal case.

Data Collection

Data was collected via interviews with test managers and program managers from ASD and WRDC, and with the managers' counterparts in the 4950th Test Wing. These managers were associated with nine flight test programs. The total number of managers interviewed was 18. Of the initial 21 programs that were possible candidates for

research, only nine met the research requirements--six ASD programs and three WRDC programs. Reasons for disqualification of these and the other unsuitable programs are the following: program termination; program sensitivity; programs still remain in the planning phase and have not yet entered flight testing and information reporting; no knowledgeable counterpart test managers remaining/available for interview (i.e., the test managers had retired); the Test Wing was not serving the SPO/Lab as the RTO (i.e., the Test Wing was just providing airframe or maintenance support to the program); and programs were new thrust programs unique to the Test Wing (i.e., manufacturing support programs with no flight testing involving the SPOs or Labs). Before the 18 interviews from the nine programs were completed, an updated list from the 4950th Test Wing became available. An additional eight possible candidate programs were identified; however, in telephone conversations with the respective Test Wing test managers, all eight were found not suitable.

Each of the 18 interviews was conducted individually and in the same format and manner to avoid bias and thus maintain integrity of data. A script of the interview questions is provided in Appendix A. Anonymity was assured to test managers being interviewed, and they were informed that their responses would be associated with generic program titles labelled by alphabet rather than by name.

The interviews involved collecting data in four areas to answer the investigative questions posed in Chapter I. The first line of interview questions solicited a definitive list of categories in which Test Wing managers report test program information to their customers before, during, and after flight test events occur. In a two-step process, each counterpart test manager (Test Wing and SPO/Lab) was asked to identify those categories they felt were applicable to their test program. First, the managers drew a line through non-applicable categories on a prescribed list. The prescribed list was taken from the 4950th Test Wing's Test Director's Guide, 4950 TESTWP 80-1, Appendix H (2:H-2). Descriptions of each category on the prescribed list were not published in this Test Wing pamphlet; however, descriptions were derived from a discussion with the 4950th Test Wing's point of contact concerning the pamphlet's Appendix H and are presented in Appendix B (15). During the interview, each respondent was encouraged to ask for clarification of category meanings to ensure understanding of the categories and consistency between respondents. In the second step of the process of identifying categories, the managers added any categories they felt were applicable to their test program but were not on the prescribed list.

Once the list was defined, the test manager was asked to assign relative weights of importance to each of the

categories. A Likert scale was presented to the interview respondent (as shown in Figure 1) for him or her to use in rating the perceived importance of each category of information.

Likert Scale 1: Importance of Categories

"How important do you consider this category to be (independent from the others) in reporting information?"

LESS
IMPORTANT

VERY
IMPORTANT

1

2

3

4

5

Figure 1. Information Importance Interview Question and Likert Scale

The second set of questions posed to test managers was to determine perceptions about Test Wing managers' flexibility in negotiating what and how information was to be reported to meet SPO/Lab test information needs. The test manager was asked to determine a list of categories of information of which there had been an occasion to negotiate over what and how information was to be reported. Then the manager was asked to rate via a Likert scale (see Figure 2) how flexible in negotiations the Test Wing was perceived to be in each category.

Likert Scale 2: Reporting Negotiability (Test Wing version)

"How flexible in reporting negotiations do you feel you were in meeting your customer's perceived information needs for this category?"

NOT NEGOTIABLE
AT ALL

EXTREMELY
NEGOTIABLE

1 2 3 4 5

Likert Scale 2: Reporting Negotiability (SPO/Lab version)

"How flexible in reporting negotiations do you feel the Test Wing was in meeting your perceived information needs for this category?"

NOT NEGOTIABLE
AT ALL

EXTREMELY
NEGOTIABLE

1 2 3 4 5

Figure 2. Reporting Negotiability Interview Question and Likert Scale

The third area of interview questions sought to collect data on the Test Wing's overall performance with respect to its reporting of test progress information. The objectives were to determine in what categories information had actually been reported and to determine how well the Test Wing was perceived to have done in reporting information--by its customers and in its own perception. Once again a Likert scale was used (Figure 3) to rate perceptions of how well the Test Wing performed overall in reporting information.

Likert Scale 3: Overall Reporting Performance (Test Wing version)

"How well do you feel you've done overall in reporting information for this category to your customer?"

POOR					OUTSTANDING
1	2	3	4	5	

Likert Scale 3: Overall Reporting Performance (SFO/Lab version)

"How well do you feel the Test Wing has done overall in reporting information to you for this category?"

POOR					OUTSTANDING
1	2	3	4	5	

Figure 3. Overall Reporting Performance Interview Question and Likert Scale

The fourth area of interest was to determine the method that was most commonly used in reporting information for each category. Primary and other communication methods were recorded along with comments about efficiency and effectiveness of the methods. Interview responses for this fourth area are recorded in Table 11 of Chapter IV.

Data Analysis

The methodology used for analyzing the data was one that assessed the four areas of reporting information discussed in the previous section (i.e., information importance, reporting negotiability, overall reporting

performance, and methods of communication). The interview responses for the first three areas were compared and analyzed using descriptive statistics (mean values) and statistical tests of significance. The fourth area under consideration, methods of communication, was also analyzed using descriptive statistics (frequency counts instead of mean values). Analysis of the four areas mentioned above was followed by discussion about reporting issues that surfaced in the open-ended comments made by the interview respondents (i.e., problems encountered in reporting or receiving information and any recommendations for improvement).

Descriptive statistics was the first method used in analyzing the areas of information importance, reporting negotiability, and overall reporting performance. The procedure for descriptive statistical analysis was to first pair the responses from all of the interviews for each category of information. Then mean values were computed from the Likert scale rankings for each category of information within each of the three areas mentioned above. These mean values were tabulated and plotted for comparison between Test Wing manager responses and SPO/Lab manager responses. Ranges of the Likert scale responses were also determined, tabulated, and compared for each category within each of the three areas.

The second method of data analysis used for the areas of information importance, reporting negotiability, and overall reporting performance was the statistical test of significance. This type of analysis was made using the statistical analysis program for microcomputers called STATISTIX. STATISTIX contains the capability to perform the two-sample parametric t test or a nonparametric alternative test called the rank sum test (also known as the Wilcoxon rank sum test). STATISTIX documentation describes the two-sample t test in the following:

This procedure computes two sample t tests, which test for differences between the means of two independent samples. It is applicable to situations where samples are drawn independently from two normally distributed groups. (11:6.10)

The two-sample t test is not an appropriate statistical test if the observations from each population are not normally distributed.

The nonparametric alternative to the two-sample t test (i.e., the rank sum test) accomodates less stringent requirements for the response data to be normally distributed and for the variances to be equal. STATISTIX describes the rank sum test as a test for differences in the central values of samples (populations in this case) from two independent samples (populations) (11:6.12).

Before discussing the procedures used in performing the statistical tests of significance (parametric and nonparametric) using the STATISTIX analysis program, it is

appropriate to address the following assumptions for parametric testing of interview data (10:358; 14:174,187; 12:111,113,118,151,152). The only assumption that applies in the nonparametric testing is the first assumption.

1. The observations are independent. Observations are defined here to be the Likert scale responses of each interviewed manager for each category of information. The observations are independent from the standpoint that the managers of the test programs from the Test Wing side and the SPO/Lab side each have their own unique perceptions about information/reporting requirements. Test Wing managers have the perspective of managing or monitoring the day-to-day flight test activities of a test program. The SPO/Lab test managers have the perspective of a Test Wing customer and of a manager of the overall test program effort. Thus, the two populations of means are considered independent. The interviews were conducted in such a way as to seek independent responses from these managers about their own perceptions. These managers were asked to refrain from any discussion with their counterparts about this research so as not to bias their independent responses.

2. The observations should be drawn from normally distributed populations. Each of the two mean value populations that were derived from the Likert scale numerical ratings of the Test Wing managers and of the SPO/Lab managers were initially considered to be normally

distributed. Verification that mean values are or are not normally distributed is demonstrated via a Wilk-Shapiro/Rankit Plot and the W test (where W denotes the Wilk-Shapiro test statistic). The STATISTIX documentation states the following about checking the normality assumption:

Wilk-Shapiro/Rankit Plots [examine] whether a variable conforms to a normal distribution . . . [and] . . . departure of the Rankit plot from a linear trend indicates non-normality, as does a small value for the Wilk-Shapiro statistic [W]. (11:8.4-8.5)

Rankit plots were performed on the data for all categories, and the W yielded by STATISTIX output was compared to quantiles (p values) for a 95% confidence level to determine normality (16:605).

3. The populations of interest should have equal variances. The two-sample t test of the STATISTIX analysis program performs tests for unequal variances as well as for equal variances. Computer output from the t test provides F test data for determination of equality of variances, and it also provides t test statistics and p values for equal and unequal variances. In some cases, the output revealed that it was highly likely that the populations had unequal variances. For those cases, the p value associated with the unequal variance was used to determine if there was significant difference in the two mean values.

4. The measurement level of data should be at least interval level so that arithmetic operations (computation of

mean values) can be used. It was possible to use arithmetic mean values for statistical analysis and comparison of interview responses because the measurement level of Likert scale response data is presumed to be interval level data. In his book, Business Research Methods, C. William Emory states that "Many attitude scales are presumed to be interval, although such claims are often challenged" (10:91). Emory further states, "Obviously the data does not know what scale it is, so whether a particular scale is interval or ordinal often is a matter of judgment" (10:91).

While the argument may exist as to whether opinion/attitude data from Likert scale rankings is appropriately considered to be interval or ordinal, inferential statistical tests (parametric tests using mean values) have been and are performed on Likert scale data as if the data measurement level is interval. Emory states that ". . . some behavioral scientists argue that parametric tests are usually acceptable for ordinal scales on both practical and theoretical grounds" (10:90). Parametric tests (namely the t test) involving the comparison of mean values are considered appropriate for this analysis because of the following:

. . . if the testing situation involves two independent samples with interval or ratio measurements, one should use the t test of differences. (10:359)

With the assumptions now defined, it is appropriate to discuss the procedures used in the statistical analysis. If

the assumptions described above were met, then the procedure for analysis would be one for the two-sample t test. If the assumptions were not met (except for the assumption of independent observations), then the nonparametric rank sum test procedure was followed. The rank sum test is a suitable alternative to the two-sample t test because it tests for the significant difference between two populations, and it is less stringent on its requirements for assumptions. The rank sum test does require that the populations be independent (as described in the first assumption). In addition to not requiring normally distributed populations, the rank sum test accomodates sample sizes (in this case, population sizes) of ten or less (14:184,187).

The idea behind the statistical analysis using the two-sample t test is to make an inference as to whether or not the mean values of the two sample responses (i.e., the two population distributions of Likert scale responses) differ significantly. A null hypothesis about the inference is established. The null hypothesis is that there is no significant difference between the Test Wing mean values and the SPO/Lab mean values for any of the categories of information. In other words, the two mean values for any category are essentially equal. The alternate hypothesis is that there is a significant difference between the two mean values for any category of information (i.e., the two

mean values for any category are not considered equal)). The level of confidence established for these tests is 95%, a typical standard. A decision rule is established to determine when the null hypothesis is to be rejected as being false or not rejected as being false. Once the t test statistic is computed from the STATISTIX analysis program, the corresponding p value (also yielded by the STATISTIX analysis program) is compared to the 95% confidence value of 0.05 (1.00 minus 0.95). If the p value is less than or equal to 0.05, then the decision is made to reject the null hypothesis and consider the two mean values significantly different. If the p value was greater than 0.05, then the decision is made not to reject the null hypothesis that the mean values can be considered equal. A tabulation of the p values and test results along with a discussion about the tabulated results is presented in Chapter IV.

The procedure for the nonparametric tests of significance is similar to that of the parametric two-sample t test; however, the inference about the populations of observations is slightly different. The null hypothesis about the two populations of Likert scale response data (Test Wing and SPO/Lab) for the rank sum test is that the two populations are identical. Compared to the parametric two-sample t test, the rank sum test determines if there is a significant difference between the central values of two independent populations, rather than determining if there is

a significant difference in mean values for the data (11:6.12). The alternate hypothesis for the rank sum test is that the two populations are not identical. Again the level of confidence is set at 95%. The decision rule for rejecting the null hypothesis is established at a p value of 0.05. If the p value was greater than 0.05, the decision was made not to reject the null hypothesis that the two population are identical. The p values and test results are presented in place of the tabulation of two-sample t test results if the assumption of normality is violated.

The last of the four areas to be analyzed was the methods Test Wing managers use to communicate to their counterparts. The most commonly used method of communication and any other methods identified by the managers were divided into classes. Frequency counts of the number of methods in each class were made for the primary methods of communication identified by each manager. Comparisons were made of the frequencies at which the methods were identified by the Test Wing and SPO/Lab managers for each category.

Following analysis of the four areas mentioned above, reporting issues from the interview respondents' open-ended comments were discussed. Comments were solicited to identify differences in reporting practices SPO managers would recommend. Also, comments were solicited to identify differences Test Wing managers would prefer in reporting

information to their customers. The discussion concluded with answers to the research questions posed in Chapter I.

IV. Results and Analysis

Introduction

The results of the data collection will be presented and analyzed or examined for the following four areas: information importance, reporting negotiability, overall reporting performance, and methods of communication. These four areas will be discussed in detail in the sections that follow. Also discussed will be reporting issues from the interview respondent's open-ended comments. The discussion will conclude with answers to the research questions from Chapter I. First, however, will be a presentation and discussion of the demographics concerning the interview respondents from the 4950th Test Wing and from the Aeronautical Systems Division (ASD) System Program Offices (SPOs)/Wright Research and Development Center (WRDC) Laboratories (Labs).

Demographics

Information about the respondents is summarized below. The interview demographic questions (see Appendix A) provided information about the respondents' experience in test management (in two cases, program management as it related to the test program), their experience with the program of interest, the current phase/general status of the program, the respondent's counterpart test/program manager, and the approximate number of times per week the two

counterpart managers were in contact concerning the test program.

Ranks/Grades of the Respondents

<u>RANK/GRADE</u>		<u>TW RES.</u>	<u>SPO/LAB RES.</u>
Major	-	1	1
Captain	-	2	1
GM-14	-	-	4
GS-13	-	3	3
GS-12	-	2	-
GS-9	-	<u>1</u>	<u>2</u>
TOTAL		9	9

Organization

For the 4950th Test Wing:

<u>OFFICE SYMBOL</u>		<u>RES.</u>
AMX	-	1
DOCA	-	1
FFCA	-	1
FFCE	-	2
FFDA	-	1
FFDS	-	<u>3</u>
TOTAL		9

For the SPOs/Labs:

<u>OFFICE SYMBOL</u>		<u>RES.</u>
ASD/SDBG	-	1
ASD/SDBX	-	1
ASD/SDCT	-	3
ASD/YWSB	-	1
WRDC/AAAI	-	1
WRDC/AAWD-1	-	<u>2</u>
TOTAL		9

Years as a Test/Program Manager

		<u>TW RES.</u>	<u>SPO/LAB RES.</u>
Least years	-	1.5	2
Most years	-	6	29
MODE	-	3.5	11 and 14 (Bimodal)

Years Managing the Program of Interest

		<u>TW RES.</u>	<u>SPO/LAB RES.</u>
Least years	-	9 months	1
Most years	-	3.5	29
MODE	-	2.5	6

Participants in the Original Program Introduction Document (PID)/Statement of Capability (SC) Negotiations

For the 4950th Test Wing:

<u>PARTICIPANTS</u>		<u>RES.</u>
Yes	-	5
No	-	4

For the SPOs/Labs:

<u>PARTICIPANTS</u>		<u>RES.</u>
Yes	-	7
No	-	2

Current Phase of the Test Program

The following table shows test manager responses when asked what phase the test program was currently in. The discrepancy in responses for final reporting is due to the time lapse between interviews of counterpart managers.

		<u>TW RES.</u>	<u>SPO/LAB RES.</u>
In Testing	-	3	3
In Final Reporting	-	2	0
Completed	-	4	6

Approximate Number of Contacts Made per Week with Counterpart Manager

<u>PROGRAM</u>		<u>TW RES.</u>	<u>SPO/LAB RES.</u>
A	-	4	5
B	-	2	3-4
C	-	2	2-3/8-10 *
D	-	5	5
E	-	10-15	15
F	-	2-3	1
G	-	3-4	2
H	-	10	5
I	-	1	1-2

* Two to three contacts were made per week when there was less test program activity, and eight to ten contacts per week were made during active testing.

Information Importance

The first of the four areas on which the interviews focused is the area of information category importance. The importance area entailed identifying the categories of information that the test manager believed to be relevant to his or her test program. In a two-step process described in Chapter III, each counterpart test manager (Test Wing and SPO/Lab) was asked to draw a line through non-applicable categories on a prescribed list. The prescribed list of categories was taken from the 4950th Test Wing's Test Director's Guide, 4950 TESTWP 80-1, Appendix H (80-1). (Categories from the list and their descriptions are presented in Appendix B.) During the interview, each respondent was encouraged to ask for clarification of

category meanings to ensure understanding of the categories and consistency between respondents. Test managers considered most of the categories of information from the list to be directly relevant to their test program. In the second step of the process of identifying categories, the managers added any categories they felt were applicable to their test program but were not on the prescribed list.

There were some categories for which the interview responses between counterpart managers for a specific program did not match. Table 1 shows a listing of programs (generically labelled by alphabet rather than name for anonymity), and the categories of information for which there was no match between the counterpart manager's perceptions about the applicability of the category to the test program.

As noted in Table 1, some additional categories were considered important by the managers being interviewed and were added to the list. None of the categories added by a manager matched the responses of his or her counterpart manager.

Reasons that the managers did not perceive all the same categories to be directly relevant to their test program could be the following: different perceptions about what the category of information entailed (although care was taken during the interviews to convey the same description of each category as shown in Appendix B); varied backgrounds and experiences of each manager; varied management

TABLE 1
MISMATCHES BETWEEN COUNTERPART TEST MANAGERS'
PERCEIVED CATEGORY APPLICABILITY
(INFORMATION IMPORTANCE)

<u>PROGRAM</u>	<u>MISMATCHED CATEGORIES</u>
A	RANGE SUPPORT
B	SUB-CONTRACTOR INTERFACE *; FINAL REPORTING *
C	PROCUREMENT/SUPPLY; ENGINEERING; RANGE SUPPORT; FLIGHT PROFILES *
D	LOGISTICS; TECHNICAL PERFORMANCE; RANGE SUPPORT
E	PROCUREMENT/SUPPLY; LOGISTICS; AIRCRAFT MAINTENANCE; RANGE SUPPORT; DEMODIFICATION; CHASE PLANE *; TECH PHOTO *
F	DEMODIFICATION REQUIRED BY EXTERNAL FACTORS *
G	CONTRACTOR FLIGHT TRAINING *; DEMODIFICATION REQUIRED BY EXTERNAL FACTORS *
H	PROCUREMENT/SUPPLY; MODIFICATION DESIGN; COMBINED TEST TEAM INTERFACE *
I	RANGE SUPPORT; PREFAB; FAA INTERFACE (SIMULATOR CERTIFICATION) *

* Responses that were added by the interview respondent.

perspectives due to the nature of each manager's perceived test management role (in two cases, the Test Wing's specified counterpart SPO manager was a program manager, not a test manager); varied perspectives about what the information requirements of the test program are or would be; and varied perspectives about what information the contractor was perceived to report to the SPO/Lab manager versus what the Test Wing manager was expected to report

(i.e., if the program involved contractor managed testing). In the cases where the contractor served as the testing agency, the 4950th Test Wing served as the SPO/Lab official monitor of the testing activities. The Test Wing reported contractor progress and problems to the SPO/Lab managers via categories of information.

Once the applicable categories were identified by the respondent, a level of "importance" was placed on each category by assigning a numbered rating from a Likert scale; where one equalled little importance and five equalled strong importance. These importance ratings were compiled from all 18 responses and averaged for each category to produce a mean value. Table 2 shows the mean values for each category. Beside each mean value is the percentage of responses for that category. Also included in the tabulation is the range (minimum and maximum) of the Likert scale ratings for each respective category.

A graph comparing the mean values from the Test Wing responses and the SPO/Lab responses is presented in Figure 4.

In analyzing the presentation of data in Table 2 and Figure 4, one can see from the response percentages that 100% of the Test Wing and SPO/Lab managers considered the following 13 categories to be directly relevant in reporting information on their respective programs: funding, manpower, documentation, schedule, planning, safety, cost, modification installation, test item, instrumentation,

TABLE 2
INFORMATION IMPORTANCE LIKERT SCALE MEAN VALUES,
PERCENT RESPONSES, AND LIKERT SCALE RESPONSE RANGES
FOR THE TEST WING AND SPO/LAB

CATEGORY	TEST WING			SPO/LAB		
	MEAN	% RES.	RANGE	MEAN	% RES.	RANGE
PROC/SUPPLY	1.9	78	1 TO 3	3.1	89	1 TO 5
LOGISTICS	2.9	89	1 TO 5	3.3	89	1 TO 5
FUNDING	4.4	100	3 TO 5	4.3	100	3 TO 5
MANPOWER	2.7	100	1 TO 4	3.8	100	2 TO 5
DOCUMENTATION	3.1	100	2 TO 5	3.8	100	3 TO 5
SCHEDULE	4.9	100	4 TO 5	4.9	100	4 TO 5
PLANNING	4.7	100	4 TO 5	4.2	100	2 TO 5
ENGINEERING	3.9	100	3 TO 5	3.8	89	2 TO 5
SAFETY	3.6	100	2 TO 5	4.2	100	2 TO 5
MOD DESIGN	3.1	89	2 TO 5	3.8	100	2 TO 5
COST	4.2	100	2 TO 5	4.0	100	2 TO 5
MOD INSTAL'N	3.7	100	3 TO 5	3.8	100	2 TO 5
A/C MAINT	2.8	89	1 TO 5	3.2	100	2 TO 5
TEST ITEM	4.1	100	3 TO 5	3.6	100	2 TO 5
INSTRUMENT'N	3.9	100	3 TO 5	3.9	100	3 TO 5
FLT TESTING	5.0	100	NONE	4.8	100	4 TO 5
TECH PERFORM	4.8	89	4 TO 5	4.0	100	3 TO 5
RANGE SPT	3.3	67	1 TO 4	4.3	78	3 TO 5
DATA ANALYSIS	3.8	100	2 TO 5	4.0	100	3 TO 5
DEMOD	3.0	78	2 TO 5	2.6	89	1 TO 4
CONTR'R INT	3.8	100	2 TO 5	3.8	100	1 TO 5
PREFAB	2.8	68	2 TO 5	3.0	56	1 TO 5

flight testing, data analysis, and contractor interface. In addition, 100% of the Test Wing managers felt that engineering information was directly relevant to their test program. Likewise, 100% of the SPO/Lab managers felt that modification design, aircraft maintenance, and technical performance were directly relevant to their program.

Another observation from Table 2 is that there are no absolute polarizations of any Test Wing and SPO/Lab mean values. The most that two paired means differ is by 1.2

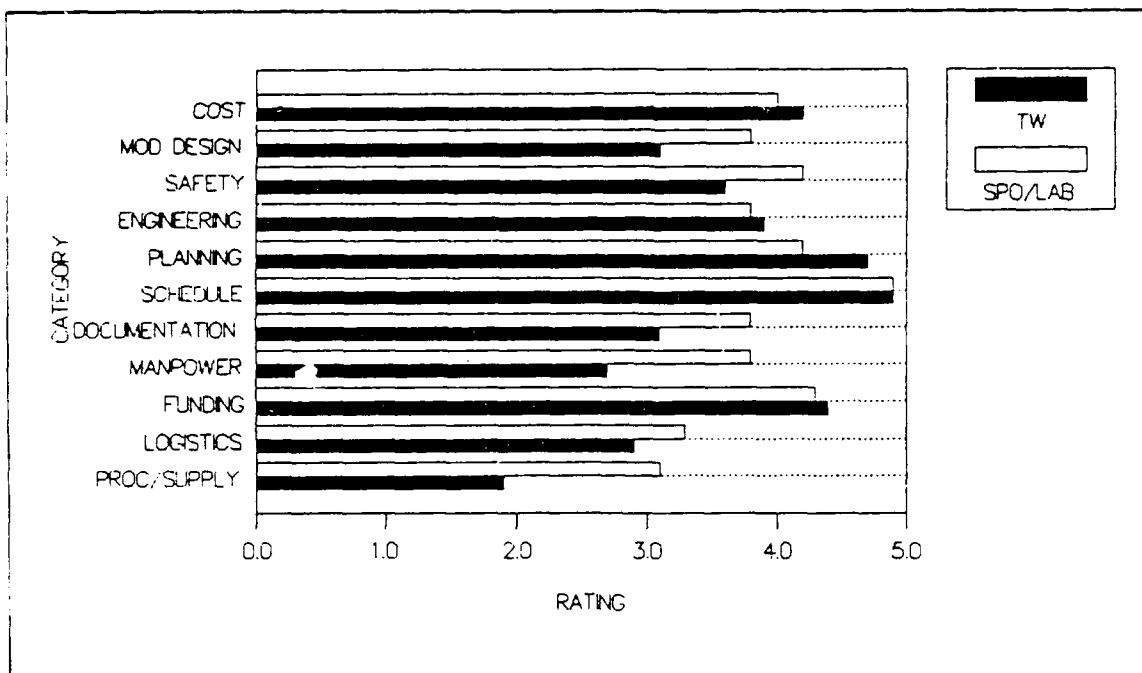


Figure 4. Information Importance Mean Comparison

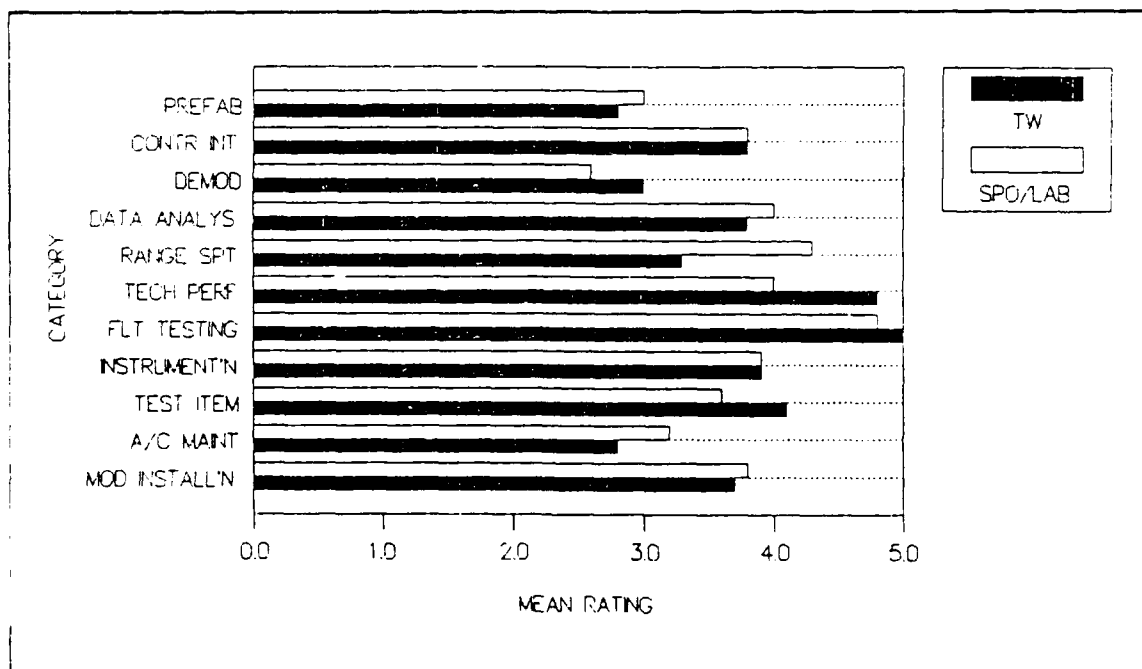


Figure 4, continued. Information Importance Mean Comparison

points (for the category of Procurement/Supply). Other categories that differ by one point or more are manpower and range support. There are three categories for which the mean values are equal for the Test Wing responses and SPO/Lab responses. Those categories are schedule, instrumentation, and contractor interface. For 16 of the 22 categories, the SPO/Lab mean values are greater than the Test Wing mean values. Finally, the category in which the least number of managers (56%) perceived it was directly relevant to their test program is the prefab category.

As discussed in the data analysis section of Chapter III, arithmetic mean values were to be the basis of comparison for statistical analysis. Original intentions were that a parametric analysis be performed on the Test Wing responses and the SPO/Lab responses via a two-sample t test. The parametric analysis was to be performed to determine if there is any significant statistical difference between the Test Wing mean values and the SPO/Lab mean values for each category's Likert scale responses.

Before the two-sample t tests were performed on the data, the necessary assumptions about the data (see Chapter III, Data Analysis section for a description of the assumptions) were checked for validity. For 13 of the 22 information categories, the Likert scale response data could not be assumed to be normally distributed. (The validity check for normality is also described in Chapter III.) In order to continue a statistical analysis of the data,

nonparametric tests were performed using the rank sum test (a variation of the Wilcoxon rank sum test). The results of these nonparametric tests are found in Table 3.

Table 3 contains p values and an indication of whether or not the populations of Likert scale responses are identical.

TABLE 3
RESULTS FROM THE RANK SUM TESTS
(INFORMATION IMPORTANCE)

<u>CATEGORY</u>	<u>P VALUE</u>	<u>IDENTICAL POPULATION DISTRIBUTIONS?</u>
PROCUREMENT/SUPPLY	0.08 *	YES
LOGISTICS	0.42	YES
FUNDING	0.67 +	YES
MANPOWER	0.02	NO
DOCUMENTATION	0.08	YES
SCHEDULE	1.00 +	YES
PLANNING	0.30 + *	YES
ENGINEERING	0.77	YES
SAFETY	0.21 +	YES
MOD DESIGN	0.15 +	YES
COST	0.85 +	YES
MOD INSTALLATION	0.76 +	YES
A/C MAINTENANCE	0.30	YES
TEST ITEM	0.15	YES
INSTRUMENTATION	1.00 +	YES
FLIGHT TESTING	0.34 +	YES
TECH PERFORMANCE	0.05 +	NO
RANGE SUPPORT	0.07 +	YES
DATA ANALYSIS	0.68 +	YES
DEMODIFICATION	0.48	YES
CONTRACTOR INT	0.85	YES
PREFAB	0.53 +	YES
+ Non-normal distributions		
* Unequal variances		

The population distributions of Likert scale responses were determined to be identical or not by computing the Wilcoxon

rank sum test statistic, W, and comparing the test statistic's corresponding p value to the 95% confidence value of 0.05 (1.00 minus 0.95). If the p value is less than or equal to 0.05, then the decision is made to reject the null hypothesis and consider the populations as significantly different. If the p value was greater than 0.05, then the decision is made to not reject the null hypothesis that the populations can be considered identical.

In all but two categories of information (manpower and technical performance), the nonparametric analysis indicates that the population of Likert scale responses for the Test Wing responses do not differ significantly from the population for the SPO/Lab responses (i.e., the population distributions can be considered identical). This indicates that for most of the categories (all but two), managers on both sides of a program have very similar perceptions as to the importance of each these categories of information as they relate to their specific test program.

Reporting Negotiability

The next area to be discussed is Test Wing manager negotiability over reporting information. Negotiability in reporting information has to do with the flexibility demonstrated by the Test Wing manager in negotiations over reporting information in such a way that satisfies the customer's perceived information needs. In each interview, the manager reviewed the same list of categories that he or

she identified as applicable in reporting test program progress. From this list, the manager was asked to cross out any categories for which no negotiations about reporting information took place. The remaining categories were those for which some type of negotiations occurred (via verbal or written form, such as agreements written into the Program Introduction and Statement of Capability documents). Of the remaining categories, there were some for which the counterpart managers for a specific program did not agree that negotiations took place. Table 4 shows a listing of programs and categories for which there was no match between counterpart managers about negotiations of reporting information and also shows categories that were added by the respondents. None of the categories added by a respondent were also added by his or her counterpart test manager.

TABLE 4

MISMATCHES BETWEEN COUNTERPART TEST MANAGERS' PERCEPTIONS ABOUT CATEGORIES IN WHICH REPORTING NEGOTIATIONS OCCURED (REPORTING NEGOTIABILITY)

<u>PROGRAM</u>	<u>MISMATCHED CATEGORIES</u>
A	PROCUREMENT/SUPPLY; MANPOWER; SAFETY; COST; AIRCRAFT MAINTENANCE; TECHNICAL PERFORMANCE
B	MANPOWER; MODIFICATION DESIGN; MODIFICATION INSTALLATION; TEST ITEM; TECHNICAL PERFORMANCE; SUB-CONTRACTOR INTERFACE *

[TABLE CONTINUES]

[TABLE CONTINUED]

<u>PROGRAM</u>	<u>MISMATCHED CATEGORIES</u>
C	PROCUREMENT/SUPPLY; MANPOWER; DOCUMENTATION; SCHEDULE; ENGINEERING; MODIFICATION DESIGN; MODIFICATION INSTALLATION; AIRCRAFT MAINTENANCE; INSTRUMENTATION: RANGE SUPPORT; DATA ANALYSIS; DEMODIFICATION; FLIGHT PROFILES *
D	PROCUREMENT/SUPPLY; LOGISTICS; DOCUMENTATION; SCHEDULE; PLANNING; ENGINEERING; SAFETY; *MODIFICATION DESIGN; AIRCRAFT MAINTENANCE; RANGE SUPPORT; DEMODIFICATION; CONTRACTOR INTERFACE; PREFAB
E	MANPOWER; DOCUMENTATION; ENGINEERING; COST; TEST ITEM; CONTRACTOR INTERFACE; CHASE PLANE*
F	LOGISTICS; SAFETY; PREFAB; DEMODIFICATION REQUIRED BY EXTERNAL FACTORS *
G	AIRCRAFT MAINTENANCE; CONTRACTOR INTERFACE; DEMODIFICATION REQUIRED BY EXTERNAL FACTORS*; CONTRACTOR FLIGHT TRAINING *
H	PROCUREMENT/SUPPLY; LOGISTICS; MANPOWER; DOCUMENTATION; SCHEDULE; PLANNING; ENGINEERING; MODIFICATION DESIGN; MODIFICATION INSTALLATION; AIRCRAFT MAINTENANCE; TEST ITEM; INSTRUMENTATION; FLIGHT TESTING; TECHNICAL PERFORMANCE; RANGE SUPPORT; COMBINED TEST TEAM INTERFACE *
I	MANPOWER; PLANNING; SAFETY; MODIFICATION INSTALLATION; INSTRUMENTATION; DEMODIFICATION; CONTRACTOR INTERFACE

* Responses that were added by the interview respondent.

Once the categories for which negotiations occurred were identified, Likert scale ratings (where one equalled low negotiability and five equalled high negotiability) were solicited to determine how flexible in negotiations the Test Wing was perceived to be by the SPO/Lab managers and by the

Test Wing managers themselves. These ratings were also averaged to compute mean values for each category. Table 5 presents the category negotiability rating mean values, the percentage of managers responding in that category, and the range of responses.

TABLE 5

REPORTING NEGOTIABILITY LIKERT SCALE MEAN VALUES,
PERCENT RESPONSES, AND LIKERT SCALE RESPONSE RANGES
FOR THE TEST WING AND SPO/LAB

CATEGORY	TEST WING			SPO/LAB		
	MEAN	% RES.	RANGE	MEAN	% RES.	RANGE
PROC/SUPPLY	3.4	56	3 TO 4	3.3	33	2 TO 4
LOGISTICS	4.0	56	2 TO 5	3.7	67	2 TO 5
FUNDING	3.4	100	2 TO 4	3.3	100	2 TO 4
MANPOWER	3.0	56	2 TO 5	3.1	78	2 TO 4
DOCUMENTATION	3.3	89	2 TO 5	3.3	44	2 TO 4
SCHEDULE	4.6	100	3 TO 5	4.2	67	3 TO 5
PLANNING	4.6	100	3 TO 5	4.2	67	3 TO 5
ENGINEERING	3.7	78	2 TO 5	3.4	56	2 TO 4
SAFETY	3.3	67	1 TO 5	3.7	67	2 TO 4
MOD DESIGN	3.8	56	2 TO 5	3.2	56	2 TO 4
COST	3.1	100	2 TO 5	3.0	78	1 TO 5
MOD INSTAL'N	3.4	56	2 TO 5	3.0	78	2 TO 4
A/C MAINT	2.8	44	2 TO 4	3.3	33	2 TO 4
TEST ITEM	3.6	78	2 TO 5	4.0	67	3 TO 5
INSTRUMENT'N	3.9	78	3 TO 5	4.2	67	3 TO 5
FLT TESTING	4.1	100	1 TO 5	4.4	89	3 TO 5
TECH PERFORM	4.1	78	3 TO 5	4.2	67	3 TO 5
RANGE SPT	3.8	44	3 TO 5	4.0	56	2 TO 5
DATA ANALYSIS	3.6	89	2 TO 5	3.4	78	2 TO 5
DEMODO	3.0	56	2 TO 4	3.5	44	3 TO 4
CONTR'R INT	4.6	56	4 TO 5	3.9	78	3 TO 5
PREFAB	3.7	33	2 TO 5	3.7	33	3 TO 4

A graph comparing the mean values from the Test Wing responses and the SPO/Lab responses is presented in Figure 5.

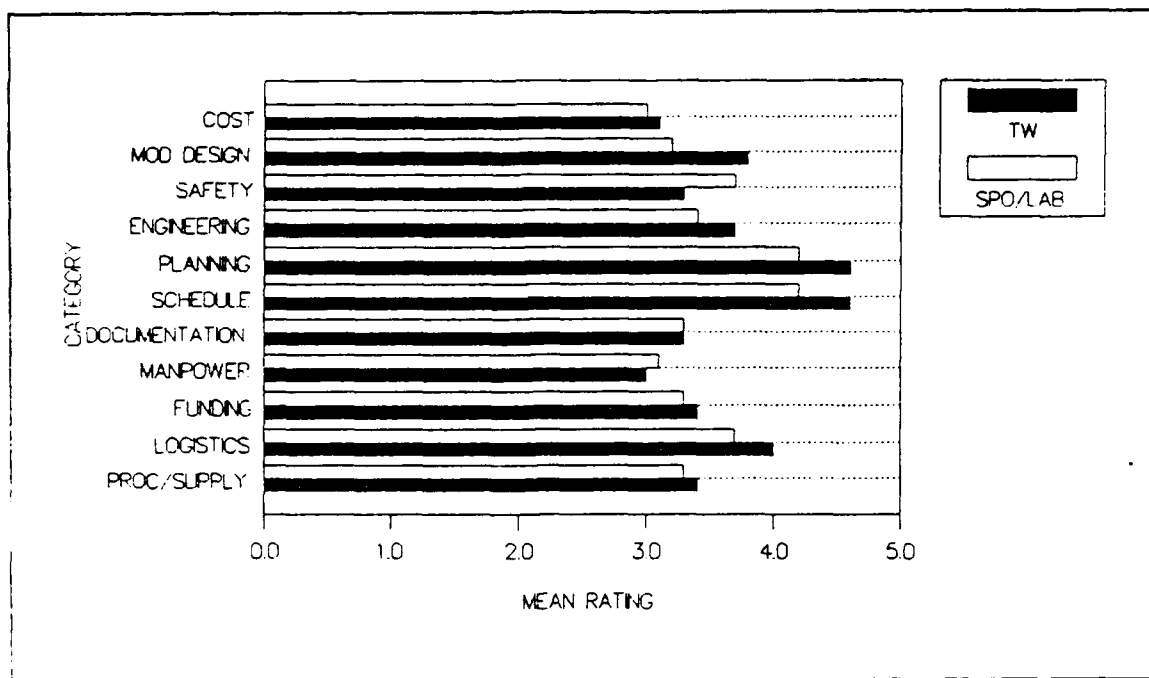


Figure 5. Reporting Negotiability Mean Comparison

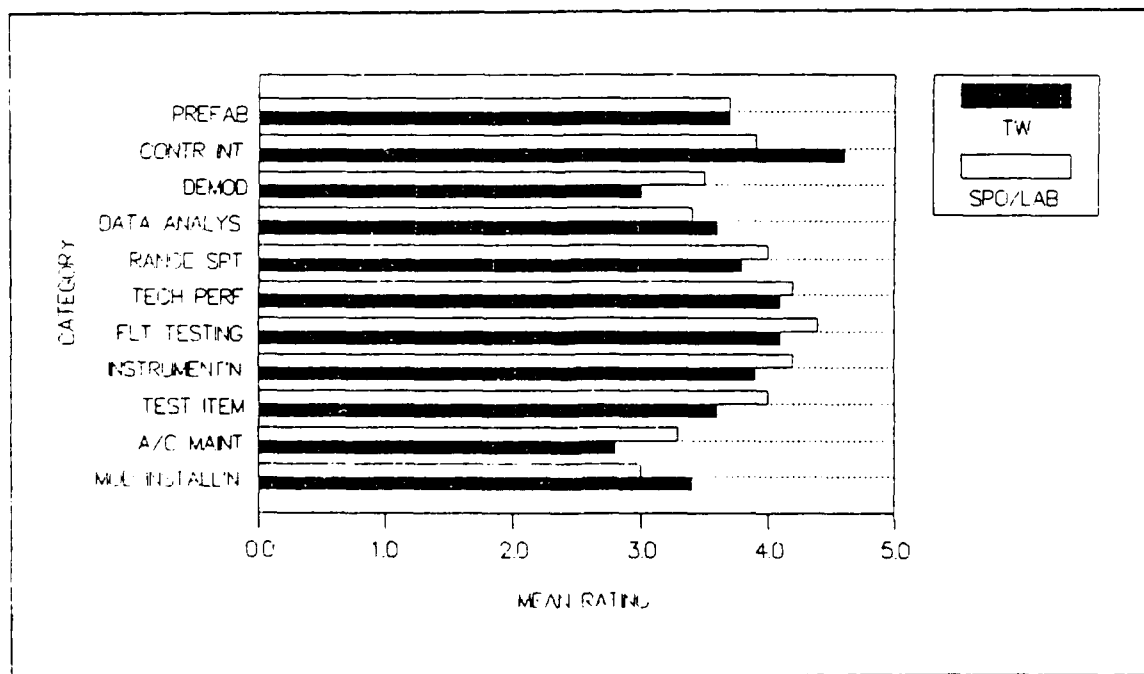


Figure 5, continued. Reporting Negotiability Mean Comparison

In analyzing the results in Table 5 and Figure 5, all of the interview respondents (100% from the Test Wing and 100% from the SPOs/Labs) perceived that reporting information in the category of funding had been negotiated between them. All of the Test Wing managers felt that reporting information in the categories of schedule, planning, cost, and flight testing had been negotiated while not all of their SPO/Lab counterparts felt the same. Test Wing managers have a higher mean value rating for 11 of the 22 categories. The categories of documentation and prefab have the same mean rating from Test Wing and SPO/Lab managers. Having the same mean rating suggests that the counterpart managers have the same perception about how flexible the Test Wing manager is in negotiating reporting requirements for these two categories. Both Test Wing and SPO/Lab managers have mean ratings of 3.3 for the Test Wing's flexibility in reporting information in the category of documentation. Test Wing and SPO/Lab managers have mean ratings of 3.7 for the category of prefab. The category receiving the lowest negotiability rating from SPO/Lab managers is cost.

In analyzing the reporting negotiability data via statistical tests of significance (as was done for the information importance area), normality assumptions were violated for 14 of 22 categories. Consequently, nonparametric rank sum tests were performed instead of two-sample t tests. The null hypothesis for the nonparametric

test is that the two populations of Likert scale responses for reporting negotiability are considered identical. The alternate hypothesis is that the two populations are not identical. Statistical nonparametric analysis using the rank sum test of the STATISTIX analysis program yielded p values greater than 0.05 for all categories. Invoking the decision rule not to reject the null hypothesis based on p values greater than 0.05 assures one with 95% confidence that the population distribution of Likert scale negotiability responses from the Test Wing managers is identical to the population distribution of SPO/Lab responses. Having identical population distributions of Likert scale negotiability responses means that interview respondents on both sides of a program have very similar perceptions about the flexibility displayed by Test Wing managers in negotiating over SPO/Lab reporting requirements.

Overall Reporting Performance

The third area to be discussed is that of the overall reporting performance of the Test Wing as perceived by its SPO/Lab customers and by the Test Wing test managers themselves. In the same manner as before, this area is analyzed using descriptive statistics (mean values) and inferential statistics (via nonparametric tests).

Overall reporting performance data was obtained by having the test manager view a carbon copy of the list yielded from previous questions identifying categories

applicable to the test program. As the manager reviewed this list, he or she was asked to mark through those categories in which no reporting occurred. When comparing the two resulting lists for a particular program, once again there were categories for which there was no match between Test Wing responses and SPO/Lab responses. Table 6 shows those categories by program for which there was no match between managers' responses. None of the categories added by a manager matched the responses of his or her counterpart.

TABLE 6

MISMATCHES BETWEEN COUNTERPART TEST MANAGERS'
PERCEPTIONS ABOUT REPORTED INFORMATION
(OVERALL REPORTING PERFORMANCE)

<u>PROGRAM</u>	<u>MISMATCHED CATEGORIES</u>
A	SAFETY; FLIGHT TESTING; DATA ANALYSIS
B	PROCUREMENT/SUPPLY; SUBCONTRACTOR INTERFACE *; FINAL REPORTING *
C	PROCUREMENT/SUPPLY; MANPOWER; ENGINEERING; AIRCRAFT MAINTENANCE; FLIGHT PROFILES *
D	LOGISTICS; ENGINEERING; SAFETY; MODIFICATION DESIGN; TEST ITEM; CONTRACTOR INTERFACE
E	PROCUREMENT/SUPPLY; LOGISTICS; AIRCRAFT MAINTENANCE; RANGE SUPPORT; DEMODIFICATION; CHASE PLANE *; TECH PHOTO *
F	DEMODIFICATION REQUIRED BY EXTERNAL FACTORS *
G	PROCUREMENT/SUPPLY; DEMODIFICATION REQUIRED BY EXTERNAL FACTORS *; CONTRACTOR FLIGHT TRAINING *

[TABLE CONTINUES]

[TABLE CONTINUED]

<u>PROGRAM</u>	<u>MISMATCHED CATEGORIES</u>
H	PROCUREMENT/SUPPLY; DOCUMENTATION; SCHEDULE; PLANNING; COST; INSTRUMENTATION; FLIGHT TESTING; TECHNICAL PERFORMANCE; DATA ANALYSIS; CONTRACTOR INTERFACE; COMBINED TEST TEAM INTERFACE *
I	PROCUREMENT/SUPPLY; LOGISTICS; DOCUMENTATION; PLANNING; ENGINEERING; SAFETY; MODIFICATION DESIGN; TEST ITEM; FLIGHT TESTING; TECHNICAL PERFORMANCE; DATA ANALYSIS; DEMODIFICATION; CONTRACTOR INTERFACE; FAA INTERFACE (SIMULATOR CERTIFICATION) *

* Responses that were added by the interview respondent.

After the categories in which reporting had occurred were identified, the SPO/Lab managers were asked to give their perceptions of how well the Test Wing performed overall in reporting information for each category. Also, Test Wing managers were asked for their perceptions of how well they felt their own overall reporting performance was. These perceptions were given by the interview respondents in a Likert scale rating where one equalled poor and five equalled outstanding. Mean values were computed from the responses for each category. Table 7 shows the mean values, percentages of responses, and ranges for each category.

As shown in Table 7, the only category in which all of the managers from the Test Wing and the SPOs/Labs assigned an overall performance rating is funding. No other categories received a 100% response from the SPOs/Labs. All of the Test Wing managers interviewed assigned perception

TABLE 7

OVERALL REPORTING PERFORMANCE LIKERT SCALE MEAN VALUES,
PERCENT RESPONSES, AND LIKERT SCALE RESPONSE RANGES
FOR THE TEST WING AND SPO/LAB

CATEGORY	TEST WING			SPO/LAB		
	MEAN	% RES.	RANGE	MEAN	% RES.	RANGE
PROC/SUPPLY	2.8	67	2 TO 4	3.7	78	2 TO 5
LOGISTICS	3.7	78	2 TO 5	4.0	67	3 TO 5
FUNDING	3.7	100	1 TO 5	4.2	100	3 TO 5
MANPOWER	3.9	78	2 TO 5	3.6	89	3 TO 5
DOCUMENTATION	3.6	89	2 TO 5	4.3	67	4 TO 5
SCHEDULE	4.6	100	3 TO 5	4.4	89	2 TO 5
PLANNING	4.7	100	4 TO 5	4.4	78	2 TO 5
ENGINEERING	3.7	100	3 TO 5	4.2	67	3 TO 5
SAFETY	4.1	100	3 TO 5	4.5	67	3 TO 5
MOD DESIGN	3.6	89	2 TO 5	4.2	67	3 TO 5
COST	3.7	100	1 TO 5	3.8	89	1 TO 5
MOD INSTAL'N	3.9	89	3 TO 5	3.6	89	1 TO 5
A/C MAINT	3.8	67	3 TO 5	3.5	67	1 TO 5
TEST ITEM	4.1	89	3 TO 5	4.0	67	3 TO 5
INSTRUMENT'N	4.0	89	2 TO 5	3.9	78	3 TO 5
FLT TESTING	4.8	100	4 TO 5	4.5	67	2 TO 5
TECH PERFORM	4.6	89	3 TO 5	4.3	67	4 TO 5
RANGE SPT	4.3	44	4 TO 5	4.6	56	4 TO 5
DATA ANALYSIS	4.6	100	3 TO 5	4.2	67	3 TO 5
DEMODO	3.7	67	3 TO 5	3.7	67	1 TO 5
CONTR'R INT	4.4	100	3 TO 5	4.2	67	3 TO 5
PREFAB	3.5	67	2 TO 5	3.4	56	2 TO 4

ratings about their performance in the categories of schedule, planning, engineering, safety, cost, flight testing, data analysis, and contractor interface (and funding as mentioned above). Mean values for Test Wing responses were higher than SPO/Lab responses for 12 of the categories and lower for nine of the responses. There was one tie between mean ratings at 3.7 for the category of demodification. Mean ratings varied from one to five within each management group. The largest difference between mean

values was 0.9 for the category of procurement/supply. Eighteen of the 22 categories are within a 0.5 difference in mean values; these categories are logistics, funding, manpower, schedule, planning, engineering, safety, cost, modification installation, aircraft maintenance, test item, instrumentation, flight testing, technical performance, range support, demodification, contractor interface, and prefab.

Figure 6 provides mean value comparisons in graphic form of the Likert scale responses of Test Wing overall reporting performance perceptions.

Statistical tests of significance were performed on the overall reporting performance Likert scale response data (as was done for the areas of information importance and reporting negotiability). In this case, the normality assumption was violated in 13 of 22 categories. For this reason, the rank sum nonparametric test was applied instead of the parametric two-sample t test. In all categories, the p values were over the 0.05 threshold, signifying that the null hypothesis was not to be rejected. The null hypothesis is that the population distributions of overall reporting performance Likert scale responses from the Test Wing and the SPOs/Labs are considered identical. Not rejecting the null hypothesis indicates that the perceptions held by Test Wing managers and SPO/Lab managers about the overall reporting performance of the Test Wing are very similar.

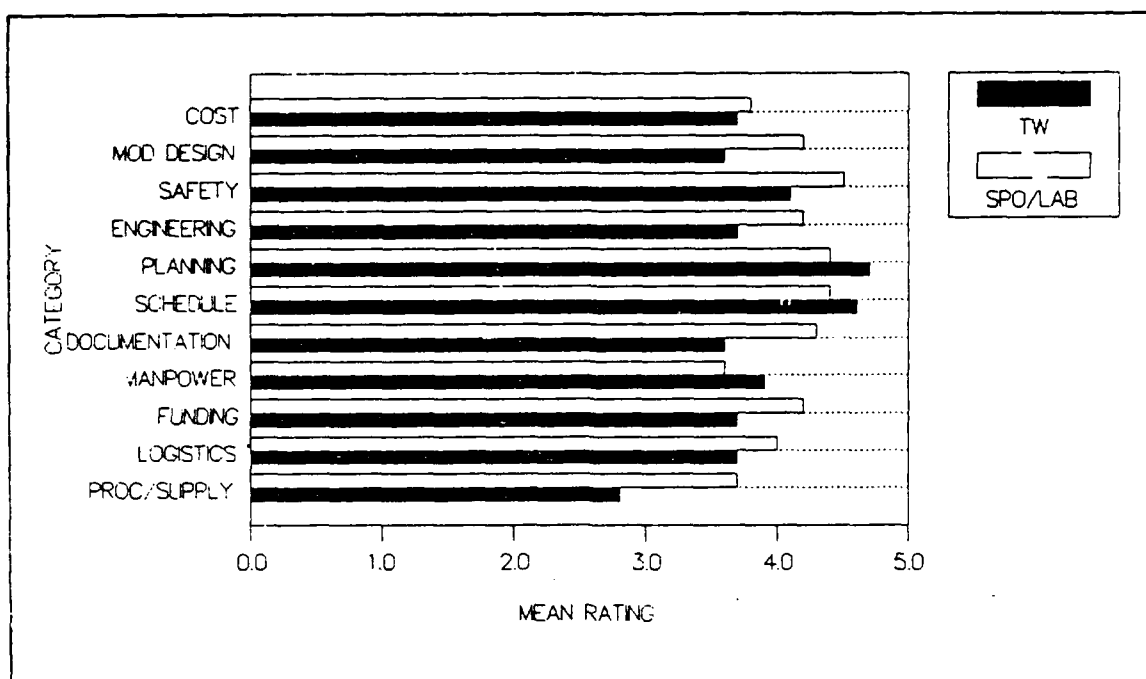


Figure 6. Overall Reporting Performance Mean Comparison

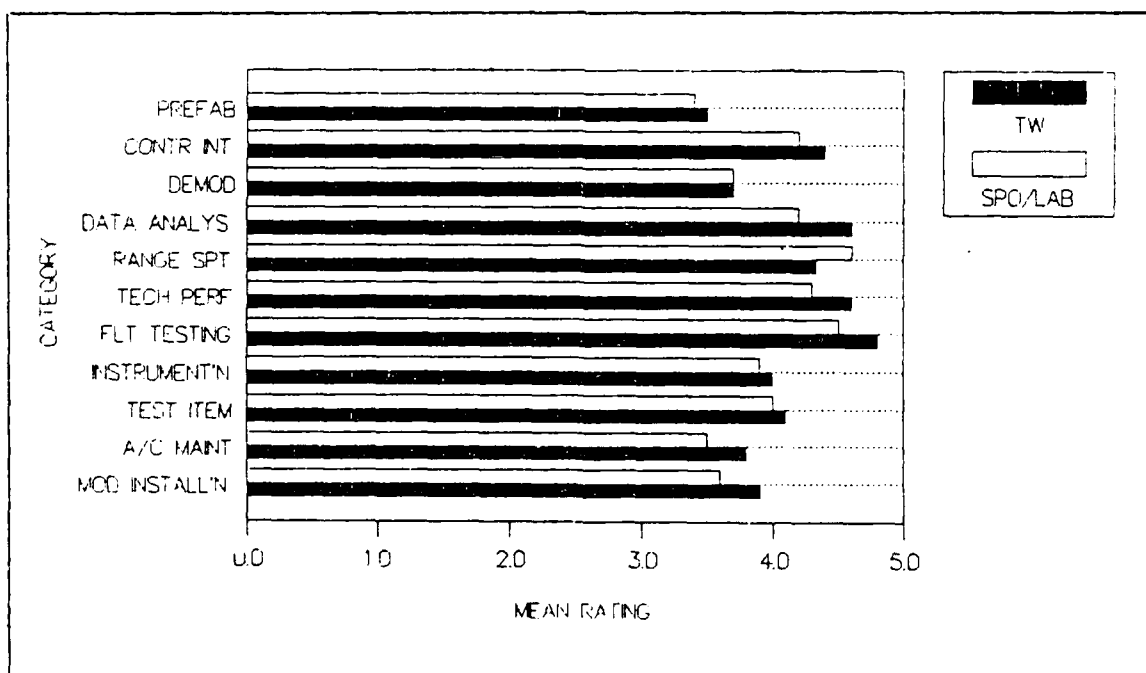


Figure 4, continued. Overall Reporting Performance Mean Comparison

Methods of Communication

Each interview respondent was asked what he or she perceived to be the most commonly used methods of communication for each of the categories of information in which reporting had occurred. The following six methods were identified by the managers: telephone, written, group meetings, dialog (i.e., face-to-face conversation between two people), fax, and computer link. Similarities and differences exist between what communication methods the Test Wing and SPO/Lab counterpart managers perceived as most commonly used by the Test Wing in reporting information. The managers' responses are presented in Table 8 by category and by program. Since reporting information was often done using more than one method, the primary response (i.e., the method considered most commonly used) is listed first in Table 8, and other responses follow.

TABLE 8
INTERVIEW RESPONSES OF THE MOST COMMONLY USED
METHODS OF COMMUNICATING TEST INFORMATION

NOTE--The legend is as follows: T is telephone, W is written, M is group meetings, D is dialog, F is fax, C is computer link-up, and an asterisk (*) means managers responded that there was no reporting done in that category.

<u>CATEGORY</u>	<u>TW</u>	<u>SPO/LAB</u>	<u>CATEGORY</u>	<u>TW</u>	<u>SPO/LAB</u>
<u>PROCUREMENT/SUPPLY</u>			<u>LOGISTICS</u>		
Program A:	T	T	Program A:	T/F	T
B:	*	T	B:	T/M	T
C:	T	*	C:	T/W	T
D:	T/M	W	D:	T/M	*

[TABLE CONTINUES]

[TABLE CONTINUED]

<u>CATEGORY</u>	<u>TW</u>	<u>SPO/LAB</u>	<u>CATEGORY</u>	<u>TW</u>	<u>SPO/LAB</u>
<u>PROCUREMENT/SUPPLY</u>			<u>LOGISTICS</u>		
Program E:	*	T	Program E:	*	T
F:	T	T	F:	T	T
G:	T/D	T	G:	T/D	T
H:	*	W/T	H:	*	W/T
I:	T/W	*	I:	T/D	*
<u>FUNDING</u>			<u>MANPOWER</u>		
Program A:	W	M/D/W	Program A:	T	D/T
B:	M/W	T/W	B:	D	M
C:	W	W	C:	*	T
D:	T/M/W	W/T	D:	*	*
E:	W/T	W	E:	W/T	W/T
F:	T/W	W	F:	T	W/T
G:	T/D	T/W	G:	T/D	T
H:	W	W/T	H:	T/W	W/T
I:	W	W/T	I:	W	W
<u>DOCUMENTATION</u>			<u>SCHEDULE</u>		
Program A:	T/W	D/M	Program A:	T	W/T/D
B:	W/M/T	W	B:	M/W	M/T
C:	W/M	W	C:	D/M	M/W
D:	*	*	D:	M/T/F	T/D
E:	W	W	E:	W/T	T/W
F:	T/W	W	F:	T/W	D
G:	T/W	T/W	G:	T/W	D/W/T
H:	W	*	H:	W	*
I:	T/W	*	I:	T/W	W/T
<u>PLANNING</u>			<u>ENGINEERING</u>		
Program A:	M	W/T/D	Program A:	T/F	W/T/D
B:	W	W	B:	M/W	M
C:	D	M/W	C:	T	*
D:	M/T/F	T/D	D:	M/T	*
E:	W/T/D	W	E:	W/M	T/W
F:	T/M	D	F:	T/M	D
G:	T	D/M	G:	T	D
H:	M/W	*	H:	T/W	W/T
I:	W/T	*	I:	W	*
<u>SAFETY</u>			<u>MODIFICATION DESIGN</u>		
Program A:	F/T/W	*	Program A:	T	M
B:	T	W	B:	M	M
C:	T	F/W	C:	M	T
D:	M/T	*	D:	M/T	*
E:	W/T/M	T/W	E:	D	T
F:	T/W	D	F:	M	D/M

[TABLE CONTINUES]

[TABLE CONTINUED]

<u>CATEGORY</u>	<u>TW</u>	<u>SPO/LAB</u>	<u>CATEGORY</u>	<u>TW</u>	<u>SPO/LAB</u>
<u>SAFETY</u>			<u>MODIFICATION DESIGN</u>		
Program G:	T/W	T	Program G:	T	W
H:	W	W/T	H:	*	*
I:	W/T	*	I:	W	*
<u>COST</u>			<u>MODIFICATION INSTALLATION</u>		
Program A:	T/W	D/W	Program A:	T/D	D
B:	M/W	W	B:	M	M
C:	W	W	C:	M	T/D
D:	M/T/W	W/T	D:	M/T	T/D
E:	W	W	E:	D	T
F:	T/W/F	T/W	F:	T	D
G:	T/W	W/T	G:	T	T/M
H:	W/T	*	H:	*	*
I:	T/W	W	I:	T/D	T
<u>AIRCRAFT MAINTENANCE</u>			<u>TEST ITEM</u>		
Program A:	T	T	Program A:	T/W	M/D/T
B:	T/M	D	B:	M/T/W	M
C:	W	*	C:	M	T/D
D:	M/T/F	T/D	D:	M/T/F	*
E:	*	T/W	E:	D/W	T/W
F:	T	W/T	F:	T	T/D
G:	T	W/T	G:	T	T
H:	*	*	H:	*	*
I:	*	*	I:	T/D	*
<u>INSTRUMENTATION</u>			<u>FLIGHT TESTING</u>		
Program A:	T/M/D	M/T	Program A:	T/W	*
B:	M	M	B:	D/M/W	T/M
C:	*	*	C:	W	C/W
D:	M/T	T/D	D:	M/T/F	T/D
E:	W	T	E:	W/D	T/W
F:	T/W	D/T	F:	T	T
G:	T	D/M	G:	T	T/W
H:	T	*	H:	M/T	*
I:	W/D	W/M	I:	T/W	*
<u>TECHNICAL PERFORMANCE</u>			<u>RANGE SUPPORT</u>		
Program A:	T/F	T	Program A:	*	*
B:	D/M/W	M	B:	M/W	M
C:	W	T/D/W	C:	*	*
D:	*	*	D:	M/T/F	*
E:	W	T/W	E:	*	T
F:	M	D/T	F:	T/M	D/T
G:	T/W	T/W	G:	T	D/M/T
H:	W	*	H:	*	W/T
I:	T/W	*	I:	*	*

[TABLE CONTINUES]

[TABLE CONTINUED]

<u>CATEGORY</u>	<u>TW</u>	<u>SPO/LAB</u>	<u>CATEGORY</u>	<u>TW</u>	<u>SPO/LAB</u>
<u>DATA ANALYSIS</u>			<u>DEMODIFICATION</u>		
Program A:	M/W	*	Program A:	T/W	M/D/W
B:	M	W	B:	T	D
C:	W	W/T	C:	*	*
D:	M/T/W	T	D:	M/T	T/D
E:	W	T/W	E:	*	T
F:	T	D/M	F:	T/W	T
G:	W/D	W	G:	T	W
H:	W	*	H:	*	*
I:	T/W	*	I:	W/T	*
<u>CONTRACTOR INTERFACE</u>			<u>PREFAB</u>		
Program A:	M/T/F/W	D/T	Program A:	T	D/T
B:	M/T/D/W	M/T	B:	T/M	M
C:	T/W/M/F	T/D	C:	*	*
D:	M/T	*	D:	M/T/F	T/D
E:	T/D	T	E:	*	*
F:	T	T/M	F:	T/W	D/M
G:	T	T/D	G:	T	T/W
H:	T/W	*	H:	*	*
J:	D/W	*	I:	T	*

The responses shown in Table 8 will be analyzed from two perspectives--by category and by program. Discussion will first focus on comparison of responses within categories, and then comparisons will be made between managers for specific programs.

In comparing only the primary communication method named by the managers (i.e., those methods identified as most commonly used by the Test Wing in reporting information), at least one match between responses of Test Wing managers and SPO/Lab managers occurred for each category. At most there are five method matches between responses from counterpart managers for a particular category. Categories for which five method matches occurred

are logistics, funding, and contractor interface. Categories in which the least number of method matches occurred for a program were schedule, engineering, modification design, aircraft maintenance, range support, demodification, and prefab. For each of these categories only one program had corresponding responses between managers.

In comparing responses by program, Test Wing managers and SPO/Lab managers of Program G specified the same primary method of communication for 13 of the 22 categories. This was the highest number of matches for any program. The next highest number of method matches was 11 for Program B, followed by seven for Program F. Programs C and E both had six method matches, and Programs A and I also tied with four matches each. Program H had only two method matches, and Program D had no method matches between Test Wing managers and SPO/Lab managers. A match between responses indicates that counterpart managers perceived the same communication method as the one most commonly used in reporting information.

Communication by the methods of telephone, group meetings, fax, and computer link messages from another terminal were used in reporting information as the name of each method implies. The dialog method was described during the interviews as face-to-face conversation between the Test Wing manager and the counterpart SPO/Lab manager in which reporting occurred. The written method took many forms

depending on the category for which it was used. Table 9 lists the specific forms in which the written method of communication was manifest.

TABLE 9
SPECIFIC FORMS OF WRITTEN COMMUNICATION
USED IN REPORTING INFORMATION

<u>PROGRAM/ CATEGORY</u>	<u>TEST WING</u>	<u>SPO/LAB</u>
Program A:		
FUNDING	Statement of Capability (SC)	Report
DOCUMENTATION	Sketches	---
SAFETY	Letters	---
COST	Formal Report	Report
TEST ITEM	Final Report	---
FLIGHT TESTING	Formal Report	---
DATA ANALYSIS	Formal Report	---
DEMODIFICATION	SC	---
CONTRACTOR INT	Reports	---
Program B:		
FUNDING	---	Prgm Intro Doc
update		
DOCUMENTATION	---	Action Items
PLANNING	---	Test Plan Doc
COST	---	Informal Cost Doc
FLIGHT TESTING	Informal Data Doc	---
RANGE SUPPORT	Letters	---
DATA ANALYSIS	---	Formal Report
CONTRACTOR INT	Letters	---
Program C:		
LOGISTICS	Letter follow-up	---
FUNDING	SC	---
PLANNING	---	Meeting Notes
COST	---	JOCAS Reports
FLIGHT TESTING	Quick Look Reports	Quick Look Rpts
Program D:		
PROCUREMENT/SUPPLY	---	Monthly Cost Rpt
FUNDING	JOCAS Mthly Stmt	---
COST	JOCAS Mthly Stmt	Monthly Cost Rpt
DATA ANALYSIS	Raw Data	---

[TABLE CONTINUES]

[TABLE CONTINUED]

<u>PROGRAM/ CATEGORY</u>	<u>TEST WING</u>	<u>SPO/LAB</u>
Program E:		
COST	---	JOCAS
Program F:		
FUNDING	Letter	---
DOCUMENTATION	Letter	---
SCHEDULE	Letter	---
COST	Letter	Monthly Reports
INSTRUMENTATION	Letter	---
DEMODIFICATION	Letter	---
PREFAB	Letter	---
Program G:		
FUNDING	Records	---
DOCUMENTATION	JOCAS	JOCAS
SCHEDULE	---	SC
MOD DESIGN	---	Changes
COST	---	Drawings
A/C MAINTENANCE	---	Sched (Routine)
FLIGHT TESTING	---	Prog/Final Rpts
TECH PERFORMANCE	---	Quick Look Rpts
DATA ANALYSIS	---	Quick Look Rpts
DEMODIFICATION	---	Statement of Cap
PREFAB	---	Drawings
Program H:		
PROCUREMENT/SUPPLY	---	Mthly Status Rpts
FUNDING	Report	Mthly Status Rpts
MANPOWER	SC	Mthly Status Rpts
ENGINEERING	---	Mthly Status Rpts
SAFETY	---	Mthly Status Rpts
COST	JOCAS	---
RANGE SUPPORT	---	Mthly Status Rpts
DATA ANALYSIS	Letter	---
CONTRACTOR INT	Letter	---
Program I:		
PROCUREMENT/SUPPLY	Test Concept Doc (TCD)	---
FUNDING	TCD/SC	Report/Letter
MANPOWER	TCD/SC	JOCAS Report
DOCUMENTATION	Prog/Final Report	---
SCHEDULE	Progress Reports	Planning Docs
PLANNING	TCD/Test Plan	---
ENGINEERING	Test Plan	---
SAFETY	Test Plan	---
MOD DESIGN	Test Plan	---
COST	JOCAS/SC	JOCAS

[TABLE CONTINUES]

[TABLE CONTINUED]

<u>PROGRAM/ CATEGORY</u>	<u>TEST WING</u>	<u>SPO/LAB</u>
Program I (continued):		
INSTRUMENTATION	TCD/Prog Rpt/Final Rpt	SC/Letters
FLIGHT TESTING	Prog Report/Final Rpt	---
TECH PERFORMANCE	Prog Report/Final Rpt	---
DATA ANALYSIS	Prog Report/Final Rpt	---
DEMODIFICATION	Prog Report/Final Rpt	---
CONTRACTOR INT	Prog Report/Final Rpt	---

There were only a few cases in Table 9 where counterpart managers on a program specified similar written responses. While some of the written responses use different vocabulary, they denote the same method of communication. Program A managers responded similarly for the communication method used in reporting cost information. The Test Wing manager said "Formal Reports" were the most commonly used method, while the SPO/Lab manager called it "Report." Program B had no matching written responses. Both managers for Program C said "Quick Look Reports" were the most commonly used methods in reporting flight test information. The Test Wing manager for Program D said that the "JOCAS Monthly Statement" (i.e., Job Order Cost Accounting System [JOCAS]) was most commonly used to report cost information, and the Program D SPO/Lab manager said "Monthly Cost Reports" were used. Program E had no matches between respondents for written methods of communication. Program F also had no written method matches. The responses from managers on Program G coincided for the

category of documentation, where both managers said "JOCAS" was the most commonly used method of reporting. For Program H, the responses for the category of funding closely matched as the Test Wing manager called his method of reporting "Written Report", and the SPO/Lab manager recognized it as "Monthly Status Reports." There were two matches in Program I for written communication methods. Both the Test Wing manager and the SPO/Lab manager said cost was reported using "JOCAS." For the category of instrumentation, the Program I managers' responses were similar in that the Test Wing manager used the "Test Concept Document" to report information, and the SPO/Lab manager said that information was reported using the "Statement of Capability" which the Test Wing manager said was part of the Test Concept Document.

Further comparisons can be made between the responses of the managers by examining the frequencies at which the methods were specified. Table 10 below shows four of the methods that Test Wing managers used to report information to their counterpart managers at the SPOs and Labs and the frequency of responses for each category. The two other communication methods that were identified by the interview respondents were fax and computer link. Fax was only mentioned twice (for the category of safety), and computer link was only mentioned once (for the category of flight testing), so they are not included in Table 10.

TABLE 10
FREQUENCY COUNTS FOR METHODS OF COMMUNICATION

<u>METHODS AND FREQUENCY FOR EACH METHOD</u>								
<u>CATEGORY</u>	<u>TELEPHONE</u>		<u>WRITTEN</u>		<u>MEETINGS</u>		<u>DIALOG</u>	
	<u>TW</u>	<u>SPO</u>	<u>TW</u>	<u>SPO</u>	<u>TW</u>	<u>SPO</u>	<u>TW</u>	<u>SPO</u>
PROC/SUPPLY	6	5	-	2	-	-	-	-
LOGISTICS	7	6	-	1	-	-	-	-
FUNDING	3	2	5	6	1	1	-	-
MANPOWER	4	2	2	4	-	1	1	1
DOCUMENT'N	4	1	4	4	-	-	-	1
SCHEDULE	4	2	2	2	2	2	1	2
PLANNING	2	1	3	3	3	1	1	2
ENGINEERING	5	1	2	1	2	1	-	2
SAFETY	4	2	2	2	1	-	-	1
MOD DESIGN	2	2	1	1	4	2	1	1
COST	4	1	3	6	2	-	-	1
MOD INSTAL'N	4	5	-	-	3	1	1	2
A/C MAINT	4	3	1	2	1	-	-	1
TEST ITEM	4	4	-	-	3	2	1	-
INSTRUMENT'N	4	2	2	1	2	2	-	2
FLT TESTING	4	5	2	-	2	-	1	-
TECH PERFORM	3	4	3	-	1	1	1	1
RANGE SPT	2	1	-	1	2	1	-	2
DATA ANALYSIS	2	2	4	3	3	-	-	1
DEMOD	4	3	1	1	1	1	-	1
CONTR'R INT	5	4	-	-	3	1	1	1
PREFAB	<u>5</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>1</u>	<u>-</u>	<u>2</u>
TOTAL	86	60	37	40	37	18	9	24

Table 10 totals show that telephone communication was specified more times by the Test Wing (86) or the SPOs/Labs (60) than any other method. The written method of communication was the next method mentioned most often by the SPOs and Labs (40); however, there was a tie between the number of times Test Wing managers specified the written method (37) and the meetings method (37). SPOs/Labs identified the dialog method (24) more often than the

meeting method, and the Test Wing specified the meeting method (37) more than the dialog method (9).

Reporting Issues

Each interview respondent was asked to share any comments about the reporting aspects of their test program. Issues raised by managers in their open-ended responses are discussed by program in the following:

Program A. Managers from both sides of this program expressed that they had a better working relationship than others due to the classified nature of the program and the uniqueness of the testing unit within the Test Wing organization. With regard to reporting information, the SPO/Lab manager made an assumption that the Test Wing was going to determine what his information needs were (i.e., he did not think it was necessary to make all his information needs known to the Test Wing).

Program B. The SPO/Lab manager for this program made specific comments about the formal cost reports he received from the Test Wing. He described these reports as "poor" and "worthless"; however, he assigned the highest score (5) in rating the Test Wing in the overall reporting performance area. He explained that even though the formal cost reports were poor, his counterpart manager in the Test Wing provided "current" estimates of cost "offline" to meet his information needs.

Program C. The Test Wing manager described this program as being different in that it was managed by a contractor instead of the Test Wing. The Test Wing does, however, have several Test Wing people dedicated to the program and reports information to its SPO/Lab customer. In reporting information to the SPO/Lab, the Test Wing manager said that he talks to different people at the SPO/Lab on different test issues--meaning that the SPO/Lab manager is not his single point of contact, although the Test Wing manager keeps his customer informed. The SPO/Lab manager, on the other hand, perceived himself as the focal point recipient of Test Wing reporting.

The SPO/Lab manager also said that the program was different from others in that the Test Wing does not function as a classical Responsible Test Organization (RTO). The nature of the program is more commercial than military. The SPO/Lab manager commented about the Job Order Cost Accounting System (JOCAS) as lagging too far behind funding and difficult to interpret. He recommended supplementing the cost report with useful information. This was the only program in which some information was said to have been reported using computer link. The SPO/Lab manager described the use of computer link to send initial flight test information electronically from the contractor test site in the form of Quick Look reports.

Program D. The Test Wing manager commented about the monthly funding and cost status reports, saying that they

were submitted to his customer from another unit within the Test Wing (RM) and not from himself.

The SPO/Lab manager commented that he does receive cost information on a monthly basis (not JOCAS) and sometimes by phone from the Test Wing, but that there is no way to identify the cost estimates. He said there is no way to track expenditures. He recommended that the Test Wing implement using Cost Schedule Control Systems Criteria (C/SCSC). Having managed the program through many generations of testing, the SPO/Lab manager commented that over the years test management has become more bureaucratic and less effective. He also said that the Test Wing served as more of a participating test organization (PTO) than a responsible test organization (RTO) on this program, but that the Test Wing still reported information to him.

Program E. As with a few of the test programs previously mentioned, this program is one in which the contractor rather than the Test Wing conducted the test program. The Test Wing did, however, ensure that tests were properly conducted to safeguard Air Force interests. The Test Wing also ensured that data collection by the contractors was valid and that contractor reports to the SPO/Lab were valid. Thus, the Test Wing was responsible to its customer, the SPO/Lab, to report information about test program progress.

Comments from the SPO/Lab manager were about his receipt of cost information. He said that at times the Test

Wing manager had no information about remaining funds on the test program.

Program F. The Test Wing manager offered no comments; however, the SPO/Lab manager commented on cost information. The SPO/Lab manager said that his counterpart manager in the Test Wing was more flexible in negotiating to meet his information needs than were the other people within the Test Wing who also handled reporting cost information. The SPO/Lab manager said he thought in general that negotiability depends on individual personality. He also said that he relied more on cost information transmitted by phone than sent to him in monthly reports--mainly because the reports were difficult to understand, and there was no bottom line costs.

Program G. The Test Wing manager for this program said that his counterpart manager preferred to be given program status updates over the telephone or in face-to-face dialog rather than in periodic reports. Since much of the reporting was done verbally, the Test Wing manager said that he also kept written records as backups to what information was reported. He said this system worked well for him. He also said that the Program Introduction document requirements (i.e., testing and reporting requirements) from the SPO/Lab were not as stringent for this program as with other programs. This may be a reflection of the somewhat laissez faire management style of his counterpart manager in the SPO/Lab. The Program G Test Wing manager also had

comments about cost reporting. He considered the JOCAS information as not being useful to his customer, so he also reported status on remaining funds and the Test Wing's rate of spending. He also said that his counterpart manager in the SPO/Lab was his focal point to which he reported information.

The SPO/Lab manager's comments corresponded with those of the Test Wing manager about cost reporting. The SPO/Lab manager said he does not care to search through JOCAS reports, so he would rather call the Test Wing manager directly for information about cost. When rating the Test Wing for negotiability in cost reporting, the SPO/Lab manager gave a high rating of five for his counterpart manager and assigned a separate lower rating of three to the Test Wing unit who supplies JOCAS reports. The SPO/Lab manager said that a unique point about his organization is that he serves as the program's engineer as well as the manager, so there is little confusion about who the focal point is.

Program H. The Test Wing manager said that for this program testing is done by a contractor, but the Test Wing concurs on flight test reports and serves as the SPO/Lab's monitor of contractor testing activities.

The SPO/Lab manager concurred that this was a contractor conducted test program, and that the Test Wing also participated. He commented about the monthly status

reports he received from the Test Wing by saying that the reports do not give enough detail for him to gain insight.

Program I. The Test Wing manager identified his primary counterpart manager to whom he reported information as the SPO/Lab program manager instead of the SPO/Lab test manager. His feeling was that all information should go to this customer focal point, but that matrix management sometimes presents problems in distorting information that eventually may get to the program manager (focal point) if he is bypassed. The Test Wing manager used a unique tool to sketch out a test program early in its development and to assist the SPO/Lab in their composition of the Program Introduction document. This unique tool is called the Test Concept Document (TCD). The Test Concept Document is early documentation of the overall approach to the test program, and according to the Test Wing manager of Program I, it became an attachment to the Statement of Capability provided by the Test Wing to the SPO/Lab.

In discussing the reporting of cost information, the Test Wing manager said that managers do not like the JOCAS system because it is commonly three to four months late, difficult to interpret actual costs, and frequently has data input errors.

The Test Wing manager said this program could have used access to a local area network (LAN) for reporting information via computer terminals. He specifically mentioned that Aeronautical Systems Division's Automated

Management System (AMS) and the Test Wing's Wing Information System (WIS) could distribute information faster than current methods. Another system that the Test Wing manager said would have been useful is the Computer Supported Network Analysis System (CSNAS). It would have been used as a project network planner of major program tasks and milestones. The problem with these computer management tools is the necessary time required and difficulty in maintaining the data base for the program. The benefit would be a capability for managers to dial up program status on the computer system as required.

The SPO/Lab manager saw some things differently from his Test Wing counterpart. For example, he said he would not have needed a computer link up with the Test Wing. He would have preferred more informal interchange of information. The SPO/Lab manager said that the Test Wing manager communicated more with the SPO/Lab engineering office than with the SPO test office or the program manager himself. He felt it was appropriate for them on this program to do so and it worked out well since the final product was an engineering data package.

The SPO/Lab manager commented about the Test Wing's negotiability by saying the Test Wing was entrenched in its way of doing things. He felt the Test Wing could have reported more of what he expected to see in each category. A specific comment about cost reporting was that the JOCAS report format was difficult to interpret. He also said the

program overran costs by a significant amount due to the Test Wing taking over a year to produce the final report which the SPO/Lab was to furnish a contractor.

Answers to Research Questions

In order to meet the research objectives stated in Chapter I, specific research questions were developed. The process of answering the research questions began by formulating the methodology discussed in Chapter III of collecting and analyzing perception data from Test Wing managers and their SPO/Lab counterpart managers. In this section, each research question from Chapter I will be restated, followed by a general response from the analysis.

Research Question No. 1

What are the current categories of information that the 4950th Test Wing reports--from the SPO management perspective and from the Test Wing management perspective?

General Response. A list of categories of information that Test Wing managers use in reporting to their customers is found in the Test Director's Guide, 4950 TESTWP 80-1, Appendix H (80-1:H-2). Those categories, with the exception of reporting (which was excluded from the interview list) and documentation/approvals (referred to as documentation in the interview list) are as follows: procurement/supply, logistics, funding, manpower, documentation, schedule, planning, engineering, safety, modification design, cost, modification installation, aircraft maintenance, test item,

instrumentation, flight testing, technical performance, range support, data analysis, demodification, contractor interface, and prefab.

From this list of 22 categories provided to the interview respondents, all were perceived as being used by the Test Wing in reporting information to their SPO/Lab customers. Those categories that were added will be addressed in the general response to the next research question.

Research Question No. 2

What, if any, additional categories of information do the Test Wing or its customers believe should be reported?

General Response. The following categories were added by the interview respondents as being applicable categories to specific programs; however, none were coincidentally added by counterpart managers: sub-contractor interface, final reporting, flight profiles, chase plane, tech photo, demodification required by external factors, and contractor flight training.

Research Question No. 3

What, if any, categories that are currently reported do either the Test Wing or its customers feel should not be reported?

General Response. During the interviews, managers were asked to draw a line through any of the categories on the prescribed list from the Test Directorate's Guide which they felt were not applicable to their program. There were only

three programs--C, E and H--for which a category (prefab) was identified by both counterpart managers as being non-applicable. The only other category counterpart managers of a program (Program H) did not identify as applicable is demodification.

While the category of prefab was not perceived as being applicable to three of the nine programs, the remaining two-thirds of the managers perceived this category as applicable. For the category of demodification, counterpart managers for only one of the nine programs considered it non-applicable. Therefore, there is no significant reason why the categories of prefab and demodification should be deleted from the prescribed list.

Research Question No. 4

What are the relative weights assigned to the actual and desired categories by SPO/Lab management and Test Wing management?

General Response. Each interview respondent was asked to assign a level of "importance" from a Likert scale (where one equalled little importance and five equalled strong importance). Mean values were computed from the responses for each category and are presented in Table 2 of this chapter. A condensed version of Table 2 is presented below in Table 11. The categories in Table 11 are presented according to the descending order of their mean relative weights.

TABLE 11
INFORMATION IMPORTANCE MEAN RATING VALUES

<u>CATEGORY</u>	<u>TEST WING</u>	<u>CATEGORY</u>	<u>SPO/LAB</u>
FLIGHT TESTING	5.0	SCHEDULE	4.9
SCHEDULE	4.9	FLIGHT TESTING	4.8
TECH PERFORMANCE	4.8	FUNDING	4.3
PLANNING	4.7	RANGE SUPPORT	4.3
FUNDING	4.4	PLANNING	4.2
COST	4.2	SAFETY	4.2
TEST ITEM	4.1	COST	4.0
ENGINEERING	3.9	TECH PERFORMANCE	4.0
INSTRUMENTATION	3.9	DATA ANALYSIS	4.0
DATA ANALYSIS	3.8	INSTRUMENTATION	3.9
CONTRACTOR INT	3.8	MANPOWER	3.8
MOD INSTALLATION	3.7	DOCUMENTATION	3.8
SAFETY	3.6	MOD DESIGN	3.8
RANGE SUPPORT	3.3	MOD INSTALLATION	3.8
DOCUMENTATION	3.1	CONTRACTOR INT	3.8
MOD DESIGN	3.1	ENGINEERING	3.8
DEMOMIFICATION	3.0	TEST ITEM	3.6
LOGISTICS	2.9	LOGISTICS	3.3
A/C MAINTENANCE	2.8	A/C MAINTENANCE	3.2
PREFAB	2.8	PROCUREMENT/SUPPLY	3.1
MANPOWER	2.7	PREFAB	3.0
PROCUREMENT/SUPPLY	1.9	DEMOMIFICATION	2.6

The mean relative weights presented in Table 11 provide a rank ordering of the categories. The table shows that the SPOs/Labs rank more categories above 3.0 than the Test Wing. From the table one can conclude that the categories of schedule, flight testing, funding, and planning are perceived by Test Wing managers and SPO/Lab managers to be among their top five most important categories in which information is reported.

Research Question No. 5

What are the most common methods Test Wing managers use in reporting test information for each category to

SPO/Lab managers, as perceived by the Test Wing and by its customers?

General Response. The methods that were identified by the interview respondents are the following: telephone, written, group meetings, dialog (i.e., face-to-face conversations between two people), fax, and computer link. Specific written categories are presented in Table 9 of this chapter.

In the interviews, the respondents were asked to identify the most commonly used method of communication in reporting information for each applicable category. Very often there were two or more additional methods identified because one method may have been a follow-up to the primary method (e.g., a letter following a telephone call to document the information exchange).

In trying to identify similarities and differences in perceptions of Test Wing managers and their counterpart SPO/Lab managers, comparison was made between the managers as to what communication method they each thought was most commonly used in reporting. For one set of managers (i.e., the counterpart managers associated with Program G), there was a 59% concurrence in responses. In other words, the two counterpart managers identified the same primary methods of communication for 13 of 22 categories. Managers from Program G had the highest number of matched responses of all the programs.

Research Question No. 6

What, if any, differences in reporting practices would SPO/Lab managers recommend?

General Response. The following is a compilation of recommendations from the open-ended comments of the SPO/Lab interview respondents about what the Test Wing managers should do in reporting information:

1. Get clarification from SPO/Lab manager as to what information he or she expects.
2. Do not use the Job Order Cost Accounting System (JOCAS) to report cost information.
3. Report cost information using a method such as the telephone rather than cost reports presently used.
4. Make JOCAS easier to interpret.
5. Submit JOCAS reports that have current cost estimates.
6. Provide a better way to track expenditures; provide Cost Schedule Control System Criteria (C/SCSC) reports.
7. Stay informed about remaining funds, and be prepared to report status to the customer.
8. Be more flexible in meeting customer cost information needs.
9. Be more timely in responding to customer information needs.
10. Provide more detail in monthly status reports.
11. Play an active role in reporting to the SPO/Lab

customer even though a contractor may be conducting the tests and reporting information to the SPO/Lab.

12. Remove bureacratic barriers.

13. Work as a team.

Most of the recommendations provided by SPO/Lab managers were regarding cost reporting. The comments expressed the managers' discontent about the Job Order Cost Accounting System (JOCAS) and their desire for cost information that is current and easy to interpret.

Research Question No. 7

What, if any, differences would Test Wing managers prefer to make in reporting information to their customers?

1. Compensate for inadequacies in formal cost reports (i.e., three to four month JOCAS report delays, level of difficulty experienced by customers in interpreting actual costs from JOCAS reports, and frequent data input errors into the JOCAS data base) by providing supplemental information via other means.

2. Keep customer focal point informed (i.e., counterpart manager) when communication and reporting occurs with various members of the customer's matrix organization.

3. Assist the customer with Program Introduction document preparation and early test planning activities by providing a Test Concept Document (TCD). The TCD is a document of the Test Wing's perspective of the overall approach to the test program.

4. Provide information to SPO/Lab customers via a Local Area Network (LAN) using the existing Automated Management System (AMS) and the Wing Information System (WIS).

5. Use the Computer Supported Network Analysis System (CSNAS) as a project network planner of program tasks.

Summary

This chapter presented the results and analysis of perception data collected from Test Wing managers and their counterpart managers in the SPOs and Labs. Comparisons were made between the managers responses to interview questions in the following four areas: information importance, reporting negotiability, overall reporting performance, and methods of communication. Analysis of the data for the first three areas was performed using descriptive statistics and statistical tests of significance to identify similarities and differences between the managers' responses. The fourth area was analyzed by listing all the methods of communication by program and by category to identify similarities and differences in responses. Frequency counts of the communication methods were also made to identify similarities and differences in perceptions between managers about which methods were most commonly used to report information. Following analysis of the methods of communication, there was discussion on the issues raised by the interview respondents in their open-ended comments.

Problem areas and a few recommendations for improved reporting from the managers were recounted. Finally, the research questions were answered as part of the results and analysis.

V. CONCLUSIONS AND RECOMMENDATIONS

Overview

This research is an attempt to help 4950th Test Wing managers determine if the Test Wing is responsive in meeting customer information needs. The following research objectives were formulated to logically determine the perceived responsiveness of the Test Wing in meeting the information needs of its SPO/Lab customers:

1. to determine the similarities and differences that may exist between the perceptions of the 4950th Test Wing and its customers concerning what constitutes effective reporting, and
2. to determine the similarities and differences that may exist between the Test Wing's assessment of its performance and its customers' assessment of Test Wing performance in reporting information.

Conclusions

There are several conclusions that can be made as a result of this study about the 4950th Test Wing's overall effectiveness in meeting customer's perceived information needs. The first conclusion is that the list of categories of information already used by Test Wing managers to report test program progress to its customers is a good foundation and includes most of what constitutes effective test progress reporting. This list is found in the Test Director's Guide, 4950 TESTP 80-1, Appendix H.

The second conclusion is that while the prescribed list of categories is a good foundation for what constitutes

effective reporting, it is not totally comprehensive. Managers perceived there to be other categories in which to report information that were not a part of the prescribed list. It is good that the Test Wing allows flexibility for its test managers to report categories outside of those on the prescribed list. Test Wing managers should be aware that their SPO/Lab counterpart managers have different perceptions about what categories of information are applicable to the test program, and they sometimes have different expectations about what should be reported. Reasons why there are differences in perceptions about what should be report are the following:

1. Different perceptions about what the category of information entailed (although care was taken during the interviews to convey the same description of each category as shown in Appendix B).
2. Varied backgrounds and experiences of each manager.
3. Varied management perspectives due to the nature of each manager's perceived test management role (in two cases, the Test Wing's specified counterpart SPO manager was a program manager, not a test manager).
4. Varied perspectives about what the information requirements of the test program were or would be.
5. The sensitivity of the program.
6. Uniqueness of the units within the Test Wing that managed the program or reported information to the customer.

7. Varied perspectives about what information the contractor was perceived to report to the SPO/Lab manager versus what the Test Wing manager was expected to report (i.e., if the program involved contractor managed testing). Being aware of these reasons for differences in perceptions about what should be reported could be valuable to Test Wing managers and SPO/Lab managers, providing them with insight about their counterpart managers.

The Test Wing should also be aware that it is sometimes perceived as not being very flexible in negotiating with its customers about what or how information should be reported. Reasons why Test Wing managers were viewed as not being flexible are the following:

1. Personality of the manager.
2. Method of communicating (i.e., a JOCAS report that was often described as useless; however, it is still used in reporting cost information).
3. Entrenchment in doing things a certain way.
4. Political factors.

The third conclusion from this study was that differences exist in how much Test Wing managers and SPO/Lab managers value the importance of the categories of information from the prescribed list. In contrasting the mean Likert scale importance ratings between counterpart managers for each category, the largest differences occur for the categories of range support, manpower, and procurement/supply. The Test Wing managers gave each of

these categories a lower importance rating, which means they are undervaluing the importance of these categories in relation to their SPO/Lab counterparts. The largest differences for which the Test Wing managers overvalue categories in relation to their SPO/Lab counterpart managers are for technical performance and test item. Awareness of these value differences may alert Test Wing managers to find out from their counterpart managers how they can be more responsive in reporting information in these categories, if they apply.

A fourth conclusion of this study is that some Test Wing customers are disgruntled about the method in which cost information is reported, and the Test Wing may want to consider some alternatives. Several comments were made by the interview respondents about the Job Order Cost Accounting System (JOCAS) describing it as "poor", "worthless", "difficult to understand", "three to four months late", "difficult to interpret", and "frequently [having] data input errors." One course of action for the Test Wing to implement in resolving the perceived cost reporting problem is to report supplemental cost information to satisfy the customer's cost information needs. This alternative has been used effectively by some Test Wing managers. Another course of action is to consider using some other cost reporting system that meets user needs.

While there are courses of action the Test Wing may want to follow in providing better service to its customers,

there are also areas in which future research may be profitable for managers of weapon system test activities.

Recommendations for Future Research

The researcher recommends that future research be conducted in the following test management areas:

1. Replicate this study for other 4950th Test Wing customers.
2. Replicate this study for other Responsible Test Organizations (i.e., other Test Wings).
3. For all programs where 4950th Test Wing customers use matrixed personnel resources, interview managers and engineers (other than the Test Wing counterpart manager) who also communicate with and receive reporting from the Test Wing manager. These interviews would seek perceptions about information reported by the Test Wing. The research could also identify similarities and differences in whether information received by the primary counterpart SPO manager from the Test Wing manager is identical to that received by the matrix managers from the Test Wing.
4. Interview the next level of managers from the Test Wing and the SPOs/Labs regarding their perceptions about reporting information and compare their responses with their subordinates' responses. Research could be conducted to determine if the supervisor's management views are imposed upon subordinates in such a way that they influence subordinates' responses.

5. Examine the effectiveness and suitability of the Job Order Cost Accounting System (JOCAS). Develop a new cost accounting/reporting system.

6. Investigate the use of a computerized Local Area Network (LAN) in reporting information to all 4950th Test Wing customers at Wright-Patterson AFB, Ohio. Use of the Automated Management System (AMS) currently in place at Aeronautical Systems Division (ASD) may be a viable vehicle for reporting information. An ASD Reserve Project Report states the following about AMS:

A direct support from AMS will eliminate some of the redundant reporting, and assist in assuring the commonality of information in all reporting and analysis systems. (3:12)

7. Investigate the use of a test program planning system.

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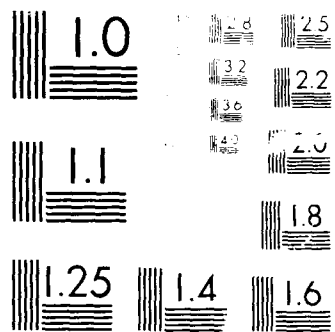
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Appendix A: Scripts of Interview Questions Asked of
SPO/Lab Managers and Test Wing Managers

Test Wing Version

Introduction

I'm doing some research for the 4950th Test Wing's Directorate of Resource Management, Plans and Programs Division, to help them in their on-going effort to maintain and improve high quality reporting to Test Wing customers. Part of this research involves collecting information from Test Wing managers, like yourself. This research also includes collecting information from the Test Wing's customers at ASD and WRDC. As a Test Wing manager, your expert opinion and ideas will be very valuable in this research effort. Let me begin by asking you some general questions about yourself and the test program you manage. (If you have any questions during any portion of this interview, please feel free to stop me and ask).

Demographics

1. Date of interview: _____
2. Name of test manager: _____
3. Rank/Grade: _____
4. Office symbol: _____
5. Name of test program: _____
6. Length of time as a test manager: _____
7. Length of time managing this program: _____
8. Participated in original PID/SC negotiations (Y/N): _____
9. Current phase of test program (i.e., testing, final reporting, completed): _____
10. Number of formal test progress reports submitted to date: _____
11. Counterpart test manager in ASD or WRDC: _____
12. Number of times per week you are in contact with your SPO/Lab counterpart: _____

Categories of Information

Category Identification: This research involves identifying categories in which test information is reported. The next few questions have to do with those categories. I want to ask you what categories of information you think are important to use in reporting to your SPO/Lab customer. To be more specific, here is a list of categories commonly used in reporting test information (present the prescribed list). The list is not all

inclusive, and you will notice as we progress through the interview that in some cases the categories overlap. If you need clarification on any of the categories, I can provide you with a description. Please look over the list and draw a line through any categories you feel are not or will not be applicable to your test program at any time during your work with your customer. You'll notice there are blank lines at the bottom of the column for you to add any categories you feel should be on the list.

Information Importance: Next I would like to get a rating from you as to how important you feel these categories are. Please assign a rating to each category that was not initially crossed out by using this scale (present Likert scale 1). Notice that there are five ratings. A rating of five means that you consider the item to be very important in effectively reporting test progress on your program. As the scale decreases to one, the item means less to you in effectively reporting test progress on your program. Rate each of the categories independently using this scale, and place the number you choose on the line to the left of each item.

Reporting Negotiability: For some of these categories, you may have had an opportunity to negotiate what and how your counterpart manager expects information to be reported. Please draw a line through those categories in which you and your counterpart manager have not negotiated reporting requirements. Now I would like to get your perception of how flexible in negotiations you feel you were in meeting your customer's reporting requirements. Using this scale (present Likert scale 2) and the list of categories of information, I want you to rate how negotiable you feel that you (the Test Wing) were in meeting the information needs of your customer for each category. As you did before, assign a number to each category which reflects how negotiable you feel that you (the Test Wing) were. A rating of five means that you were extremely negotiable. As the scale decreases in number, the rating reflects that you were less negotiable for whatever reason. A rating of one means that you were not negotiable at all. Rate each of the categories using this scale and place the number you choose on the line to the right of each category.

Overall Reporting Performance: For this next area, I want to identify all the categories in which you have reported some information. Please draw a line through any category in which you have not reported information to your counterpart manager. In the same manner as before, I want you to assign a rating for how well you feel that you (the Test Wing) have done overall in reporting test information in each of the categories. Using this scale (present Likert scale 3), assign a rating to each category by putting a number on the line to the right of each item. A rating of five means you feel that you have done outstanding in reporting test information to your customer for that

category. A rating of one means that you feel you have done poorly in reporting in that category.

Communication Methods: Now we are at the final portion of the interview. I want to identify how you have communicated information to your customer. Please tell me what you think is the most commonly used method of communicating test information (whether it be by memorandum, formal report, telephone, telefax, etc.) for the following categories (those in which some reporting has occurred). I would also like to know if there are other communication methods you use for each category as well.

Lastly, if you have any comments about the methods of communication or comments about reporting in general, please let me know.

This now concludes my formal interview questioning. Do you have any comments or questions I can address?

Prescribed List of Categories of Information (2:H-2)

WEIGHT	CATEGORY
-----	PROCUREMENT/SUPPLY
-----	LOGISTICS
-----	FUNDING
-----	MANPOWER
-----	DOCUMENTATION
-----	SCHEDULE
-----	PLANNING
-----	ENGINEERING
-----	SAFETY
-----	MODIFICATION DESIGN
-----	COST
-----	MODIFICATION INSTALLATION
-----	AIRCRAFT MAINTENANCE
-----	TEST ITEM
-----	INSTRUMENTATION
-----	FLIGHT TESTING
-----	TECHNICAL PERFORMANCE
-----	RANGE SUPPORT
-----	DATA ANALYSIS
-----	DEMODIFICATION
-----	CONTRACTOR INTERFACE
-----	PREFAB
-----	-----
-----	-----
-----	-----

Likert Scales

Likert Scale 1: Importance of Categories

"How important do you consider this category to be (independent from the others) in reporting information to your customer?"

LESS
IMPORTANT

VERY
IMPORTANT

1

2

3

4

5

Likert Scale 2: Reporting Negotiability

"How flexible in reporting negotiations do you feel you were in meeting your customer's perceived information needs for this category?"

NOT NEGOTIABLE
AT ALL

EXTREMELY
NEGOTIABLE

1

2

3

4

5

Likert Scale 3: Overall Reporting Performance

"How well do you feel you've done overall in reporting information for this category to your customer?"

POOR

OUTSTANDING

1

2

3

4

5

SPO/Lab Version

Introduction:

I'm doing some research for the 4950th Test Wing to help them in their on-going effort to maintain and improve high quality reporting to Test Wing customers. Part of this research involves collecting information from Test Wing customers, like yourself. This research also includes collecting information from the Test Wing's own members. As a Test Wing customer, your expert opinion and ideas will be very valuable in this research effort. Let me begin by asking you some general questions about yourself and the test program you manage. (If you have any questions during any portion of this interview, please feel free to stop me and ask).

Demographics

1. Date of interview: _____
2. Name of test manager: _____
3. Rank/Grade: _____
4. Office symbol (include ASD or WRDC): _____
5. Name of test program: _____
6. Length of time as an ASD/WRDC test manager: _____
7. Length of time managing this program: _____
8. Participated in original PID/SC negotiations (Y/N): _____
9. Current phase of test program (i.e., testing, final reporting, completed): _____
10. Number of formal test progress reports received from Test Wing to date: _____
11. Counterpart test manager in 4950th Test Wing: _____
12. Number of times per week you are in contact with your Test Wing counterpart: _____

Categories of Information

Category Identification: This research involves identifying categories in which test information is reported. The next few questions have to do with those categories. I want to ask you what categories of information you think are important for the Test Wing to use in reporting to you. To be more specific, here is a list of categories (present the prescribed list) that are commonly used by the Test Wing in reporting to you. The list is not all inclusive, and you will notice as we progress through the interview that in some cases the categories overlap. If you need clarification on any of the categories, I can provide you with a description. Please look over the list and draw a line through any categories you feel are not or will not be applicable to your test program at any time during your work with the Test Wing. You'll notice there are blank lines at the bottom of the column for you to add any categories you feel should be on the list.

Information Importance: Next I would like to get a rating from you as to how important you feel these categories are. Please assign a rating to each category that was not initially crossed out by using this scale (present Likert scale 1). Notice that there are five ratings. A rating of five means that you consider the item to be very important in effectively reporting test progress on your program. As the scale decreases to one, the item means less to you in effectively reporting test progress on your program. Rate each of the categories independently using this scale, and place the number you choose on the line to the left of each item.

Reporting Negotiability: For some of these categories, you may have had an opportunity to negotiate with your counterpart manager in the Test Wing as to what and how you

expect information should be reported to you. Please draw a line through those categories in which you and your counterpart manager have not negotiated reporting requirements. Now I would like to get your perception of how flexible in negotiations you feel your counterpart Test Wing manager was in meeting your reporting requirements. Using this scale (present Likert scale 2) and the list of categories of information, I want you to rate how negotiable you feel the Test Wing was in meeting your information needs for each category. As you did before, assign a number to each category which reflects how negotiable you feel the Test Wing was. A rating of five means that they were extremely negotiable. As the scale decreases in number, the rating reflects that your counterpart manager was less negotiable for whatever reason. A rating of one means that your counterpart was not negotiable at all. Rate each of the categories using this scale and place the number you choose on the line to the right of each category.

Overall Reporting Performance: For this next area, I want to identify all the categories in which you have received some information from your counterpart manager at the Test Wing. Please draw a line through any category in which you have not received information from your counterpart manager. In the same manner as before, I want you to assign a rating for how well you feel the Test Wing has done overall in reporting test information in each of the categories. Using this scale (present Likert scale 2), assign a rating to each category by putting a number on the line to the right of each item. A rating of five means you feel your counterpart manager has done outstanding in reporting test information for that category. A rating of one means that you feel your counterpart has done poorly in reporting in that category.

Communication Methods: Now we are at the final portion of the interview. I want to identify how your counterpart manager in the Test Wing has communicated information to you. Please tell me what you think is the most commonly used method of communicating test information (whether it be by memorandum, formal report, telephone, telefax, etc.) for the following categories (those in which some reporting has occurred). I would also like to know if there are other communication methods you use for each category as well.

Lastly, if you have any comments about the methods of communication or comments about reporting in general, please let me know.

Prescribed List of Categories of Information

Same as Test Wing version.

Likert Scales

Likert Scale 1: Importance of Categories

"How important do you consider this category to be (independent from the others) in reporting information?"

LESS
IMPORTANT

VERY
IMPORTANT

1

2

3

4

5

Likert Scale 2: Reporting Negotiability

"How flexible in reporting negotiations do you feel the Test Wing was in meeting your perceived information needs for this category?"

NOT NEGOTIABLE
AT ALL

EXTREMELY
NEGOTIABLE

1

2

3

4

5

Likert Scale 3: Overall Reporting Performance

"How well do you feel the Test Wing has done overall in reporting information to you for this category?"

POOR

OUTSTANDING

1

2

3

4

5

Appendix B: Description of Terms for Categories of Information

Descriptions for the categories below were derived from the researcher's understanding of the terms and a conversation with the point of contact for Appendix H of the Test Director's Guide, 4950 TESTWP 80-1 (15:2:H-2).

Procurement/Supply. Purchases or loan of equipment and parts which may impact the test program progress (e.g., long lead items).

Logistics. Provision and maintenance of resources in support of flight testing. This category includes the transportation of equipment and movement of personnel supporting the test effort. The only area of logistics excluded from this broad category in this research is aircraft maintenance.

Funding. Allocation of funds to the Responsible Test Organization by the System Program Office or Laboratory. Information reported could be notification of a deficiency of funds or overage of funds.

Manpower. Availability of people to accomplish the program and/or test mission (e.g., other priorities may take away resources and thus delay the program).

Documentation. Information involving more than just written reports. For example, information regarding engineering drawings and processing of airworthiness certificates and environmental certificates are reported in this category.

Schedule. Information about general impacts, advances, and/or delays in the established milestones and inchstones of the program.

Planning. The strategy, considerations, and courses of action in successfully accomplishing the program. Information commonly reported includes a defect in or lack of planning.

Engineering. Integration of the technical aspects of the specific tests to be accomplished during flight testing.

Safety. Concerns about the safe conduct of the tests (i.e., safety of flight concerns, safety certifications for the modifications and equipment, mishap avoidance, etc.).

Modification Design. Form and fit design concerns that may create problems in which a component is not designed to properly interface with other component(s).

Cost. Estimates and actual dollar expenditures incurred by the Responsible Test Organization.

Modification Installation. Manifestation of form or fit problems during the installation of the modification. Component interface problems may arise involving the aircraft, the modification, special mountings, equipment palletization, etc.

Aircraft Maintenance. Planned or unplanned occurrences of downtime for the aircraft to be inspected/serviced or repaired.

Test Item. The physical device(s) to be tested.

Instrumentation. Equipment installed in the aircraft used to measure and record test data involving the test item(s).

Flight Testing. Actual conduct of tests and collection of appropriated data during a flying mission.

Technical Performance. Operation or functioning of the Test Wing with regard to the effectiveness of the tests.

Range Support. Support of resources that provide the physical space to test, targets, simulated and/or actual threats, support aircraft, etc.

Data Analysis. Manual or computerized determination of test results (i.e., the transformation of flight test data into useful information).

Demodification. Removal of the test item and its associated equipment.

Contractor Interface. Interaction between Government personnel and contractor employees involved with the testing.

Prefab. Prefabricated test item components or test item support equipment (i.e., radomes, cables, racks, wingtips, etc).

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Vita

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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GSM/LSR/89S-25			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION School of Systems and Logistics		6b. OFFICE SYMBOL (if applicable) AFIT/LSY	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology (AU) Wright-Patterson AFB OH 45433-6583			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 4950th Test Wing		8b. OFFICE SYMBOL (if applicable) RMX	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code) Wright-Patterson AFB OH 45433			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
					WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) THE IDENTIFICATION AND EVALUATION OF FLIGHT TEST CATEGORIES OF RESPONSIVENESS IN REPORTING WEAPON SYSTEM TEST PROGRAM INFORMATION BY THE 4950TH TEST WING					
12. PERSONAL AUTHOR(S) Thomas E. Lollis II, Captain, USAF					
13a. TYPE OF REPORT MS Thesis		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 1989 September	
15. PAGE COUNT 109					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
14	02		Test and Evaluation		
05	02		Information Transfer		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
Thesis Advisor: Charles R. Fenno Associate Professor Department of Communication and Organizational Sciences Approved for public release: IAW AFR 190-1. <i>Larry W. Emmelhainz</i> LARRY W. EMMELHAINZ, Lt Col, USAF 14 Oct 89 Director of Research and Consultation Air Force Institute of Technology (AU) Wright-Patterson AFB OH 45433-6583					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL Charles R. Fenno, Assoc Professor			22b. TELEPHONE (Include Area Code) (513) 255-6761		22c. OFFICE SYMBOL LSR

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The purpose of this research was to identify meaningful measures (categories) of responsiveness for 4950th Test Wing managers and System Program Office/Laboratory managers to use to evaluate Test Wing effectiveness and responsiveness in meeting customer test program information needs.

The study found that Test Wing managers have available to them a prescribed list of categories of information (from Appendix H, Test Director's Guide, 4950 TESTWP 80-1) through which they can report test program information to their customers. Customers such as the Aeronautical Systems Division System Program Offices and the Wright Research and Development Center Laboratories differ from Test Wing managers in their perceptions about which categories are applicable to their programs. Test Wing managers and their customers value the importance of the categories of information similarly for most of the categories. Although many perceptions about the category of information applicability and importance may be similar, differences do exist and for a variety of reasons.

The Test Wing was rated by itself and its customers in how flexible they were perceived to be in negotiating what and how information for each category was to be reported to customers. Results showed that Test Wing managers and their customers have similar perceptions.

In rating Test Wing overall reporting performance for each category of information, Test Wing managers and their customers have similar perceptions.

Open-ended comments by the interview respondents suggested reform in the methods in which the Test Wing reports cost information.

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